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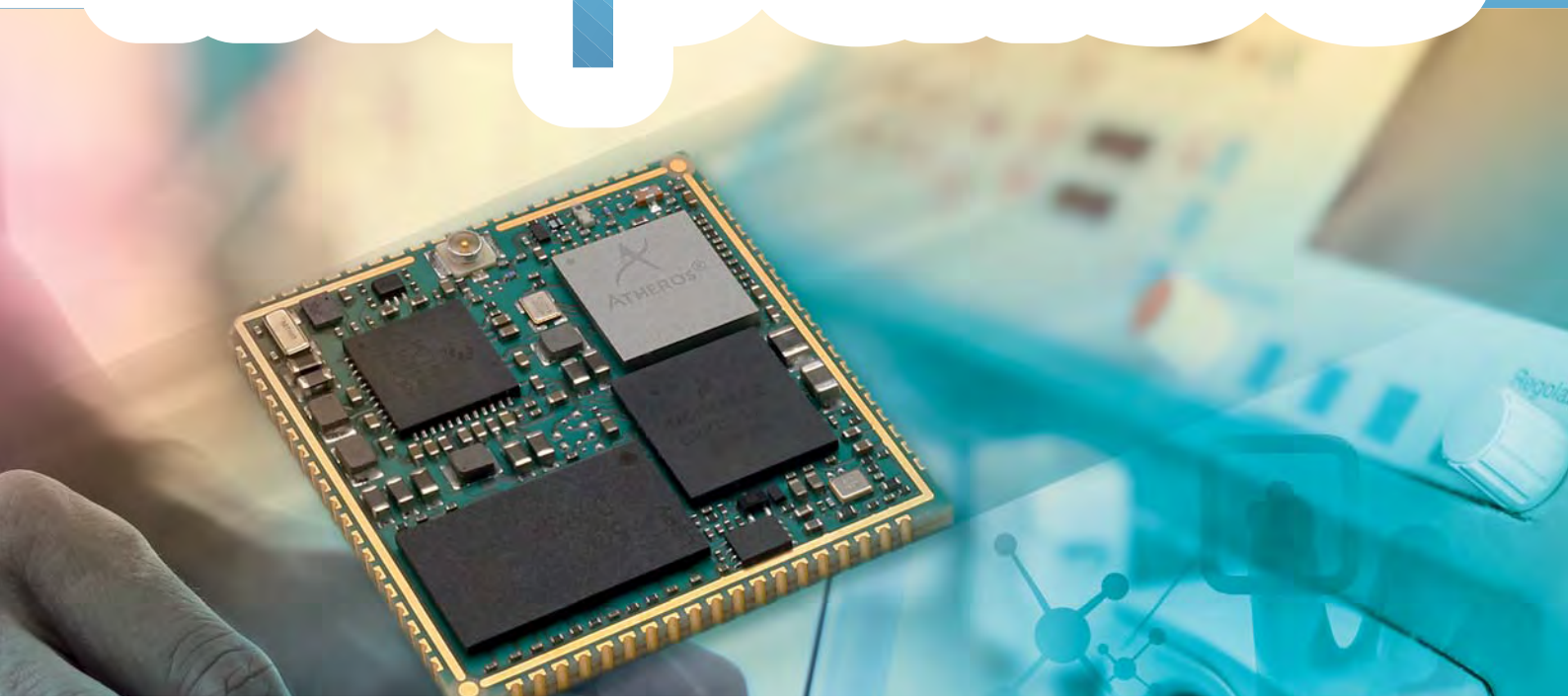

DIGI's ConnectCore 6 Family

Lima & Rambutan Modules by 8DEVICES

Light Touch Switches by PANASONIC

Multifunctional: DINKLE BUS

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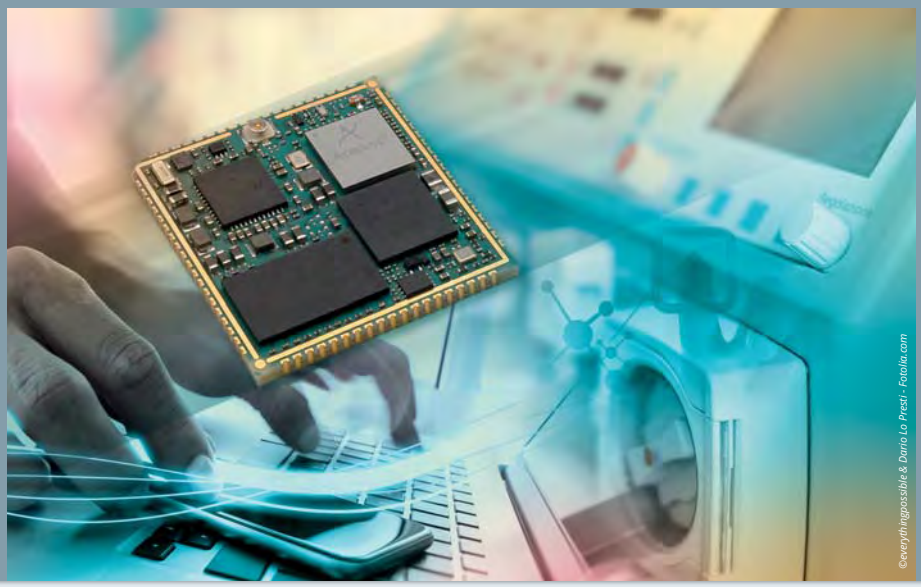

ACTIVE COMPONENTS

PASSIVE COMPONENTS

CONNECTORS

CODICO IN-HOUSE

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Look!

CODICO now offers a Sample Shop for online sample orders too.

A particular highlight on the new CODICO Website is the brand new Sample Shop, where a large number of available samples can be ordered. This means that customers can count on the support of CODICO right from the start of a project, rapidly and without any complications. As well as the advantage of free dispatch, other impressive features of the shop are its user-friendliness, its design, and the rapid delivery of the products.

And another special detail is the extremely practical overview of the whole CODICO product portfolio. »You can always find the right person to contact, and that means that a real specialist with the most up-to-date technical know-how will take care of your inquiry«, says Sven Krumpel, CEO CODICO, commenting on the advanced online presence. We look forward to welcoming you to the Sample Shop soon.

D01

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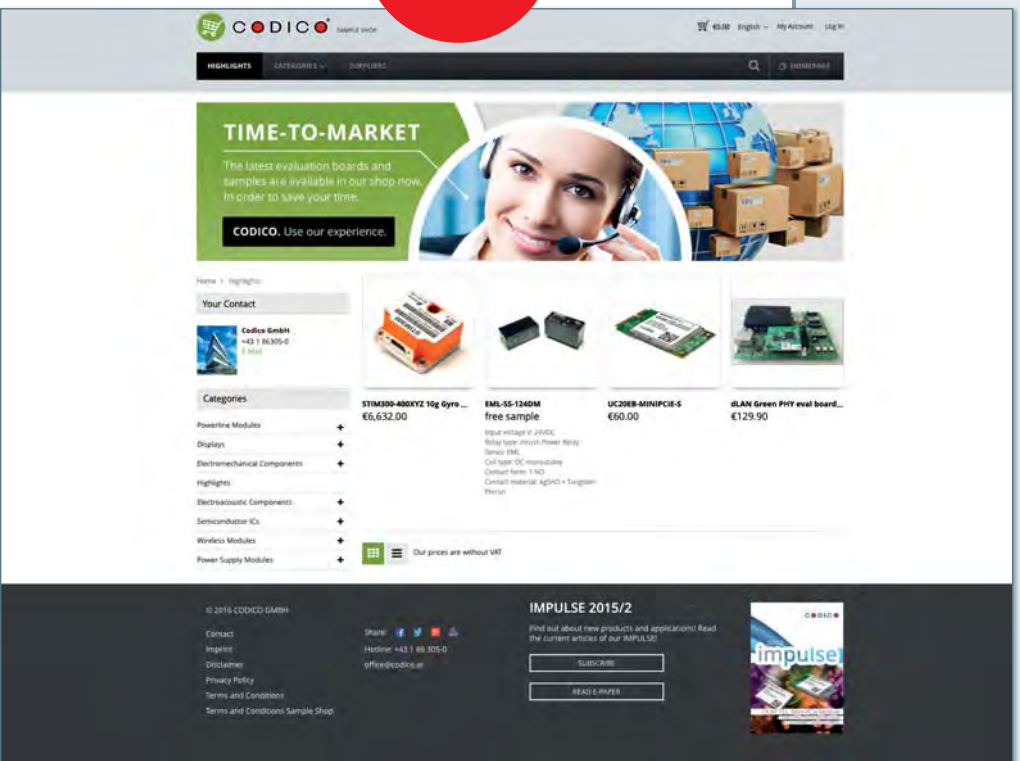
Sven Krumpel
CEO CODICO

CODICO Italia

LOOK



Editorial

Lots of news!

CODICO had an exciting start in the new year: we have learned so many new things in just a few weeks, and I want to share them with you. In late 2015, we exceeded the 100 million euros mark in sales for the first time. Over the last few years, as an almost 40-year old family company, we achieved growth well above average compared to others in the sector. I must admit that I am very proud of this company - and of our staff. We were only able to achieve all this with a lot of trust, joint efforts, and dynamic growth.

In February 2016, we announced the relaunch of our new website www.codico.com. The homepage stands out with a modern layout, a responsive design for optimal use on mobile phones and tablets, informative content, and bilingual user interface, and is tuned to the users' current needs. Its special highlight, however, is the possibility to order samples online in our shop at www.codico.com/shop! You can now quickly and easily rely on CODICO's support already at the beginning of your project.

In March of this year, we managed to reach another »100« mark: our headquarters in Perchtoldsdorf now employs 100 people! We are always happy over new entries, and we want to use this opportunity to extend a very warm welcome to all new colleagues.

On March 1, CODICO Italia Srl was founded. This new CODICO office in Treviso now joins our existing branch offices in Munich and Stockholm. So 2016 is off to an exciting start! Let's hope it continues that way!

D02

Sven Krumpel

LIMA & RAMBUTAN

Limone: yurakp - Fotolia.com, Rambutan: ©khumthong - Fotolia.com

Two ripe fruits that deliver essential vitamins!

Devices

The advantage of embedded WiFi modules is that, in addition to the WiFi connection, they also accommodate an application processor and memory on the module, thus requiring no external processing power. Moreover, these modules are already calibrated during production and have obtained several pre-certifications. Therefore, apart from saving themselves several years of development work, users can also save costs for certification, production, and RBOM.

As an authorized design partner of Qualcomm Atheros, 8DEVICES specializes in the development and manufacturing of embedded WiFi modules. When it introduced Carambola 2 back in 2014, 8DEVICES was dead right about where the trend was heading to. Based on the AR9331 System-on-Chip (SOC), the module meets a whole series of requirements (802.11/b/g/n, 24K MIPS@400MHz, 16MB Flash/64MB RAM, Ethernet, USB, etc.), is easy to integrate, and enjoys wide support from the Linux/OpenWRT communities.

In short, users hardly had any reason to complain and were delighted over its problem-free, quick design implementation. By introducing the two new modules Lima and Rambutan, 8DEVICES hopes to continue this success story. After almost two years of development and several optimizations, it has reached its objective: 8DEVICES is proud to present two new technically and functionally mature modules offering more computing power and higher data speed, plus a swathe of other interesting features.

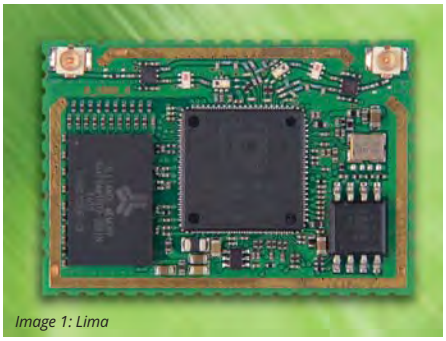


Image 1: Lima

Lima

Lima (Image 1) is based on the QCA4531 System-on-Chip (SoC) (Image 2), which can be found in the IoT (Internet of Things) product group of Qualcomm Atheros. This SoC is very similar to the AR9331 SoC of Carambola 2, but a series of low power modes were added to it with IoT applications in mind. (e.g. gateways, hubs, etc.) It also supports MIMO 2x2, thus doubling data rates to 300Mps (TCP/IP net data rate ~190Mbps) in 802.11n/HT40 applications as compared to the AR9331. In order to cope with this data throughput, the speed of the MIPS 24Kc processor was increased from 400MHz to 650MHz. As regards the interfaces, the manufacturer essentially maintained the same as those of the Carambola 2. In addition to GPIOs and serial interfaces, the module also features 2 x Ethernet (100 Mbps) and one USB2.0. I2S, SLIC and SPDIF, however, were replaced by a PCIe-RC interface and are thus no longer supported. Nevertheless, these interfaces can be easily software-emulated at lower data rates.

A positive change is that the size has shrunk from 28x38mm to 25x35mm compared to Carambola 2. When integrating the module, however, users must take into account that the 6 SMD block capacitors migrated to the back side of the module for better RF performance and stability. Therefore, the PCB must provide for a small recess to allow for the soldering of the module without an additional socket. This recess, however, must only measure less than 5x3mm. Carambola 2, on the other hand, is populated only on one side, so that it can be processed without such a recess. The fact that the Lima module is available both for commercial and industrial temperature ranges is particularly welcome news. In contrast, Carambola 2 is available only for the commercial temperature range.

In a nutshell: Compared to Carambola 2, Lima offers more processing power, higher data rates thanks to MIMO 2x2, an industrial temperature

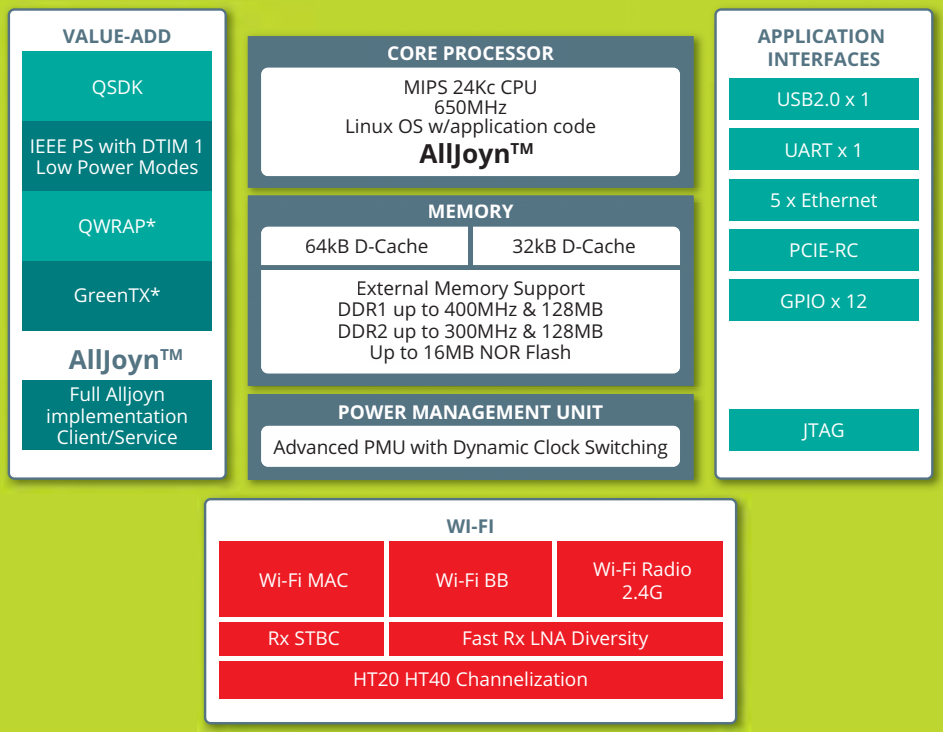


Image 2: QCA4531 block diagram

range, a PCIe interface, and a slightly smaller form factor. Both modules, however, share the following characteristics: MIPS CPU, same memory configuration, 2 x Ethernet and 1 x USB interfaces, and 802,11 b/g/n (single band). On the other hand, Carambola 2 offers additional audio interfaces and is only populated on one side. Therefore, it is not always advisable to migrate from Carambola 2 to Lima.

8DEVICES intentionally avoided the name Carambola 3 so as to rule out from the outset that Lima would be seen as a successor of Carambola 2. Lima was not intended to replace Carambola 2 but to be an addition to the range.

Features Lima

- SoC QCA4531 (QUALCOMM ATHEROS)
- 24Kc MIPS@650MHz, 64kB I-Cache and 32kB D-Cache
- 2.4GHz, 802.11b/g/n, MIMO 2x2
- Maximum output power: 21dBm
- 16MB NAND Flash and 64MB DDR2 RAM@300MHz
- Size: 25x35mm
- 1 x USB2.0, 2 x Ethernet, 1 x PCIe-RC, serial ports, GPIOs
- U.FL antenna connector
- Commercial and industrial temperature range

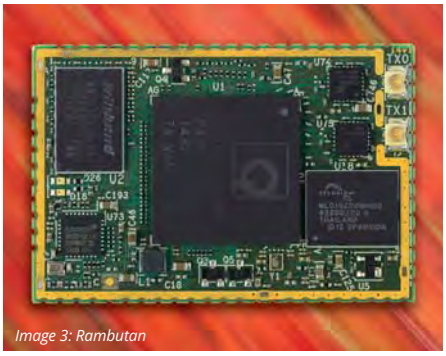


Image 3: Rambutan

Rambutan

Those who don't find the performance of Lima or Carambola 2 adequate, or are looking for a WiFi dual band solution are likely to find Rambutan (Image 3) a more interesting proposition. In addition to the significantly higher memory footprint of 128MB NAND flash and 128MB DDR2 RAM, at 720MHz Rambutan also offers more processing power thanks to an MIPS 74Kc architecture. Another distinctive feature compared to Lima and Carambola 2 is the SGMII interface, which allows users to add an external Gigabit Ethernet PHY to the module. As a result, a Gigabit Ethernet connection is also available in addition to the Ethernet 100Mbps interface. Moreover, the board features a PCIe-RC and two USB2.0 interfaces. The MIMO 2x2 antenna configuration can be used for both 2.4GHz & 5GHz frequency bands. One should add, however, that only one frequency band (2.4GHz or 5GHz) can be operated at a given time, and that both bands can only be used with time-division multiplexing. The PCB must feature a recess for Rambutan as well, yet due to the more complex design, this one must be significantly larger (around 24x22mm) than the one for Lima (5x 3mm). Rambutan was originally designed in one version featuring a SoC (QCA9557). Since Qualcomm Atheros only offers this component for the commercial operating temperature range, however, a second version was also developed based on the QCA9550, which also covers the industrial temperature range. When comparing the datasheets of the two components, you will realize that these are both functionally and physically almost identical. In addition to the extended temperature range, however, the QCA9550 also offers WiFi Enterprise Features, which make it interesting for more than just industrial applications.

Features Rambutan

- SoC QCA955x (QUALCOMM ATHEROS)
- 74Kc MIPS@720MHz, 64kB I-Cache and 32kB D-Cache
- 2.4/5GHz, 802.11a/b/g/n, MIMO 2x2
- Maximum output power: 21dBm
- 128MB NAND Flash and 128MB DDR2 RAM@300MHz
- Size: 32x47mm
- 2 x USB2.0, 1 x Ethernet, 1 x SGMII, 1 x PCIe-RC, serial ports, GPIOs
- 2 x U.FL antenna connectors
- Commercial temperature range (QCA9557)
- Industrial temperature range and enterprise feature (QCA9550)

Of course, OpenWrt is still available for users of Lima and Rambutan and, in addition to the Linux kernel, it also offers a read/write file system and several open source software packages. VPN, VoIP, a firewall and a Web interface are also included. Development kits (Image 4 and 5) and samples are immediately available at CODICO.

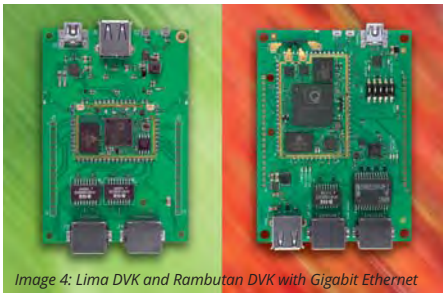


Image 4: Lima DVK and Rambutan DVK with Gigabit Ethernet

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Distributor Agreement Spans Europe, Middle East and Africa

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DISTRIBUTION AGREEMENT WITH DIGI INTERNATIONAL

CODICO and DIGI International®, (NASDAQ: DGII, www.DIGI.com), a leading global provider of mission-critical machine-to-machine (M2M) and IoT connectivity products and services, announced a distribution agreement for Europe, the Middle East and Africa (EMEA). Under this new agreement DIGI embedded and RF products will now be available through CODICO's Active Components Group in EMEA.

DIGI provides wireless M2M connectivity that delivers the reliability, scalability, security, and bulletproof performance needed to build and deploy critical infrastructures in challenging environments. DIGI's M2M products include embedded system-on-modules; RF products, including XBee® modules, gateways, modems, adapters, range extenders, and sensors; DIGI Transport® cellular gateways/routers and Rabbit modules and single-board computers.

Our goal is to become the top European demand creation distributor, and DIGI is a key relationship in helping us to achieve that goal,« said Sven Krumpel, chief executive officer, CODICO.

»As a leading EMEA distributor of electronic components, CODICO's Active Components Group is an important additional avenue for DIGI to continue to deepen its presence throughout the region,« said Frederic Luu, vice president of Asia and EMEA sales and marketing, DIGI International.

To learn more about the DIGI International products available from CODICO, visit www.codico.com.

A02

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EMBEDDED-SOLUTIONS

i.MX6 System-On-Module (SOM) connected with Single-Board-Computer (SBC)

The connected DIGI ConnectCore 6 product family is an ultra-compact and highly integrated embedded system solution based on the NXP/Freescale i.MX6 Cortex-A9 processor family and available in both SMT Module and SBC form factors. With processor speeds up to 1.2GHz and fully pin-compatible dual lite-/dual-/quad-core variants, the ConnectCore 6 offers a truly future-proof platform solution with scalable performance for long-term product life cycles. Integrating wireless communication is simple with pre-certified wireless 802.11a/b/g/n and Bluetooth 4.0, including Bluetooth Low Energy connectivity.

Connected ConnectCore 6 System-on-Module Solution

The ConnectCore 6 system-on-module's low-profile and surface-mount design maximizes integration flexibility and significantly reduces design risk in a highly cost-effective, reliable form factor with optimized heat dissipation capabilities even in the most demanding quad-core system configurations.

Connected ConnectCore 6 Single Board Computer

The ConnectCore 6 SBC is a compact and versatile off-the-shelf single board computer (SBC) platform in a Pico-ITX form factor. It offers significantly reduced time-to-market by virtually eliminating the traditional risk, effort, and complexity of custom board designs without sacrificing flexibility or capabilities.

Built on the ConnectCore 6 SOM, it delivers a common SBC platform with scalable performance, pre-certified Bluetooth 4.0 and WiFi integration, XBee RF module and cellular connectivity options, Gigabit Ethernet support, multi display/camera and audio support, external storage, expansion connectors, and reliability in harsh environments.

ConnectCore for i.MX6UL - Coming Soon

Based on the NXP i.MX6UL application processor, the ConnectCore 6UL is the intelligent communication engine for today's secure connected devices in industrial applications, all within a 29x29mm footprint. It seamlessly integrates dual-Ethernet and pre-certified dual-band WiFi (802.11a/b/g/n/ac) with Bluetooth 4.1 connectivity.

Embedded device security is a critical design aspect for the growing number of connected applications (»IoT«) and the ConnectCore for i.MX6UL removes the implementation barriers by providing you with a fully integrated, secure module platform with complete Linux software support.

DIGI offers complete hardware and software support to customers to make sure customers go to market quickly and without the traditional design risk. By providing customers full access to source code, a strong 5-year warranty, global technical support, and a commitment to long-term product availability, DIGI is a strong partner for your success.

In case of any questions please contact:

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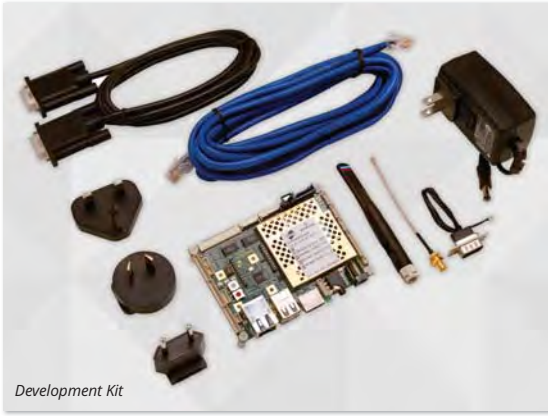
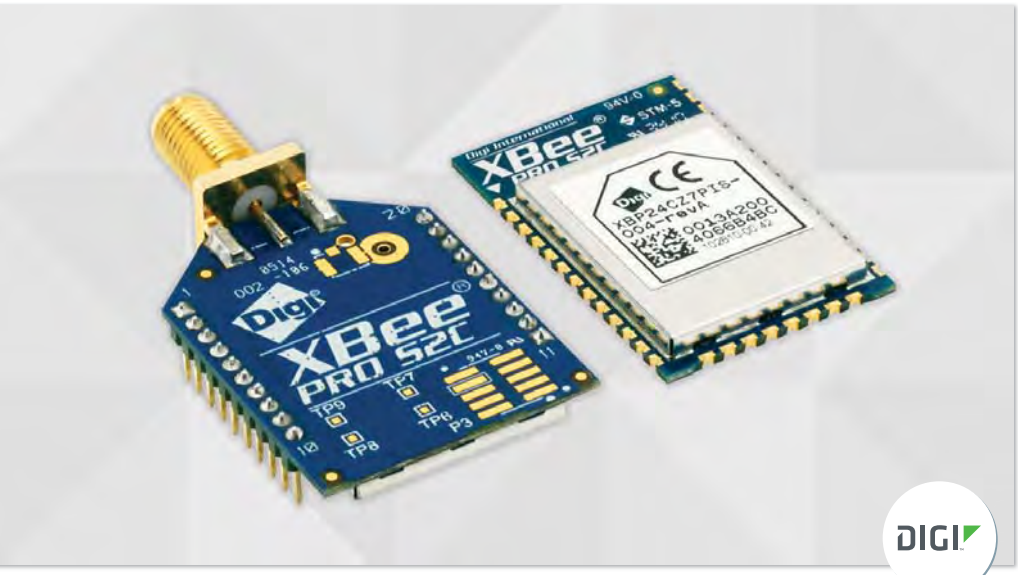


Development Kit

XBee®

ZigBee Modules for Embedded Wireless



DIGI XBee® is a family of RF modules manufactured by DIGI International that supports a wide range of wireless protocols operating over the unlicensed ISM band including: 802.15.4, ZigBee, WiFi, DigiMesh and Thread. Each module is pin-compatible making it simple to swap out modules for greater design flexibility.

The XBee ZigBee module, available on the Silicon Labs EM357 or EM3587 transceiver, provides users with more RAM and flash memory while reducing total power consumption – perfect for industrial sensor and automation applications requiring wireless connectivity. And, with sub 1 microamp sleep current, the XBee ZigBee module will perform in applications with the most demanding energy budgets.

Other key benefits:

- Through-Hole and Surface Mount form factors enable flexible design options
- Multiple antenna options: PCB, U.FL, RPSMA and wire
- XBee Gateways provide simple cloud connectivity over cellular, WiFi & Ethernet
- Link budgets of 110dB for XBee and 119dB for XBee-PRO ZigBee
- Industry leading sleep current of sub 1µA on EM357 platform and sub 2µA on the EM358 platform
- Firmware upgrades via UART, SPI or over the air (OTA)
- Interoperable with other ZigBee PRO feature set devices, including devices from other vendors
- Updatable to Thread on the EM3587 platform

XBee ZigBee modules are ideal for applications in the energy and control markets where manufacturing efficiencies are critical. The Serial Peripheral Interface (SPI) provides a high-speed interface and optimizes integration with embedded microcontrollers, lowering development costs and reducing time to market.

Software-Support

Every DIGI XBee customer can download and access the free configuration and testing utility software, XCTU. This graphical interface simplifies firmware updates, changing module configurations, and provides a host of tools like an API frame builder and spectrum analyzer to assist in wireless development.

Get Started

Start designing your wireless mesh solution today with the XBee ZigBee Mesh Kit. The new development kit features three XBee ZigBee modules and three Grove development boards, so you can quickly start prototyping a mesh network with various sensors and actuators.

In case of any questions please contact:

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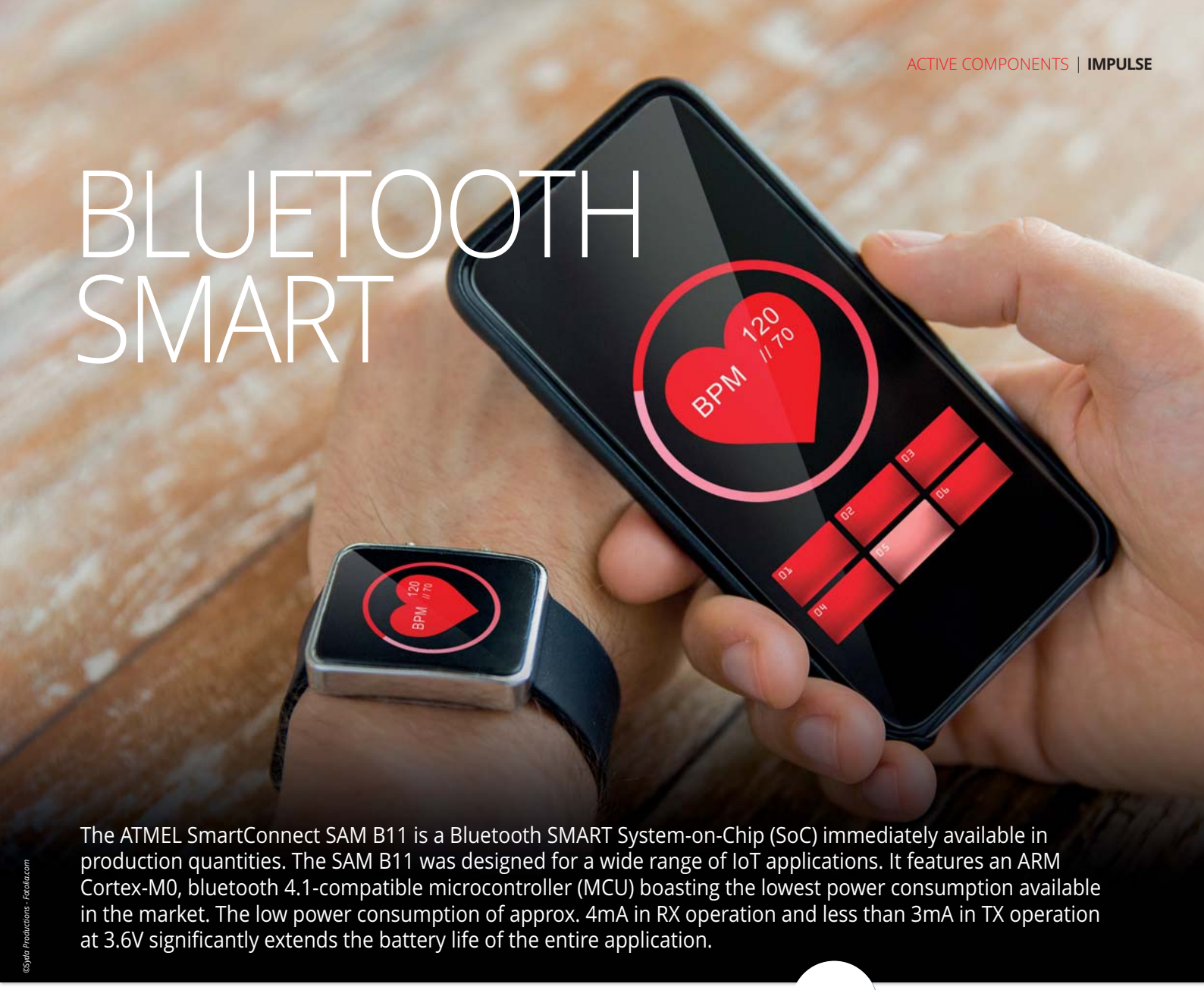
BLUETOOTH SMART



The ATMEL SmartConnect SAM B11 is a Bluetooth SMART System-on-Chip (SoC) immediately available in production quantities. The SAM B11 was designed for a wide range of IoT applications. It features an ARM Cortex-M0, bluetooth 4.1-compatible microcontroller (MCU) boasting the lowest power consumption available in the market. The low power consumption of approx. 4mA in RX operation and less than 3mA in TX operation at 3.6V significantly extends the battery life of the entire application.

The SAM B11 SoC is available in a 6x6mm QFN housing with 30 outputs. Production-ready and fully certified bluetooth modules, however, are also available in two versions. Modules SAMB11-MR210CA and SAMB11-MR510CA are completely identical, the only difference between them being an additional hardware security chip. This version is SAMB11-MR510CA and allows for additional encryption. Both modules are FCC ETSI/CE certified, thus significantly reducing the design-in and time-to-market costs. Their extremely low power consumption opens completely new application areas in the rapidly growing IoT and wearables market. These include, just to name a few, smart wearables like fitness trackers, medical applications, asset trackers, beacons, and many more.

	BTLC1000	SAM B11
Advertising Interval 100 ms	85.7µA	103.74µA
Advertising Interval 1 sec	10.5µA	12.67µA
Advance Wakeup Time	<1ms	2.43ms

As an ultra-low-power bluetooth SMART System-On-Chip (SoC) solution with integrated ARM Cortex-M0 microcontroller, SAM B11 features a 256KB flash memory and a complete set of peripherals such as ADC, PWM, GPIO, timer and quadrature decoder, and a bluetooth low energy (BLE) 4.1-compatible transceiver. A power management unit is already built in, allowing for a direct connection of batteries with a voltage from 2.3 to 4.3V. The voltage at the pins is limited by the internal flash to 2.3 - 3.6V. The SAM B11 component uses an innovative radio and DSP architecture that delivers extremely low power consumption along with high performance. The need for very few external components minimizes the total system solution costs.

An ATMEL SAM B11 Xplained Pro evaluation kit is already available for SAMB11-MR210CA and SAMB11-MR510CA modules. The SAM B11-MR510CA module also includes an integrated ATMEL ATECC508 crypto authentication security

solution. As regards software development, the kit is supported by ATMEL Studio, ATMEL's integrated development platform. ATMEL Studio already offers a software example for very simple integration into the respective application.

The kit includes an on-board debugger, thus eliminating the need for additional external tools for development.

A05

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MULTI RAIL EMBEDDED AC-DC POWER SUPPLY

There has been a continuous drive to improve efficiency in low power AC/DC mains power supplies over the last decade and this trend is set to continue with the new EU CoC V5 tier 2 and USA DoE 6 regulations coming into effect in 2016 which require a minimum efficiency around 70% at 6W and less then 100mW no load power consumption for external power supplies. POWER INTEGRATIONS has introduced the latest generation in the LinkSwitch™ product family, the LinkSwitch-4, to address the requirement for continuous efficiency improvement. This new family integrates some novel technical innovations which improve efficiency whilst reducing costs in offline power supply designs.

LinkSwitch-4 ICs have been developed to address this requirement for high efficiency, high reliability, low cost power supplies for mobile, consumer and medical applications. LinkSwitch-4 controllers feature an adaptive base and emitter switched drive scheme to boost switching performance and increase efficiency. The advanced switching technique is especially beneficial in high-voltage applications as it reduces the slow turn-off switching losses seen in conventional base only switched designs and eliminates BJT failures due to secondary breakdown.

This dramatically improves the reverse-bias safe operating area (RBSOA) and overall system reliability. See Figure 1a and 1b.

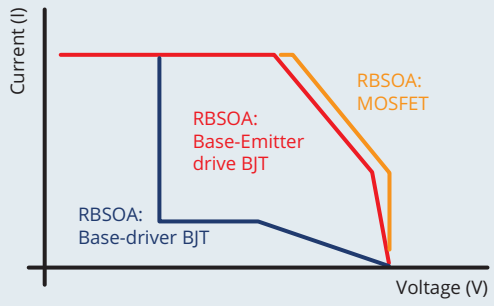


Figure 1a: Reverse Bias Safe Operating Area Base Switched External BJT

When a MOSFET or Bipolar Junction Transistor (BJT) turns off the current falls to zero and the voltage across it increases to the supply voltage.

A slow turn off dissipates more energy as the transistor spends more time in the transition zone. By switching the external bipolar transistor's base and emitter, the LinkSwitch-4 IC significantly reduces the time spent in the crossover region leading to a reduction in switching losses and an improvement in efficiency. The adaptive base and emitter switching technique removes the minority carriers before switching and drives Vbe negative during turn off, preventing secondary breakdown and RBSOA failure.

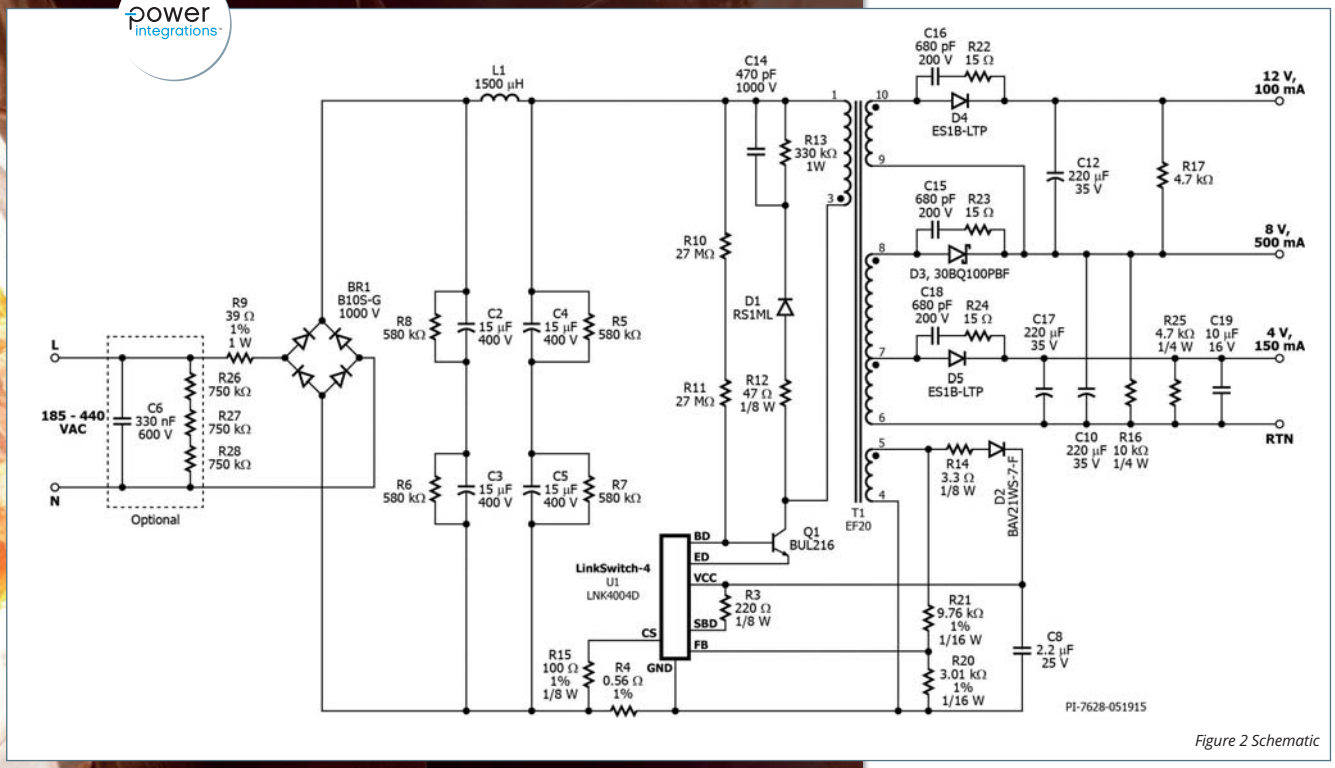


Figure 2 Schematic

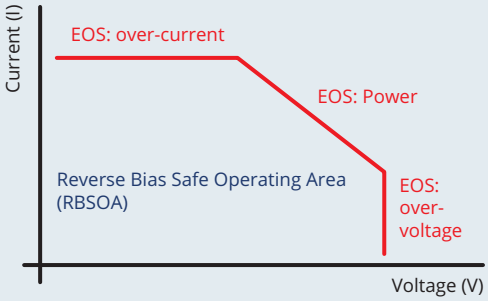


Figure 1b: Reverse Bias Safe Operating Area Base-Emitter Switched External BJT

LinkSwitch-4 devices increase the RBSOA of the external BJT to be almost the same as a MOSFET operating under the same conditions, improving reliability of the supply during standard operation and fault modes.

Other innovations include fast active start-up with no external FET required to reduce No Load Power consumption (less than 30mW in the LNK4004D). Efficiency is retained over a wide load range and even at 10% load the LinkSwitch-4 IC can deliver between 65 - 75% efficiency. A Supplementary Base Drive (SBD) pin is available which provides double the base current (up to 80mA) to enable the use of larger high power BJT's with lower current gains, without adding to the internal power dissipation of the device.

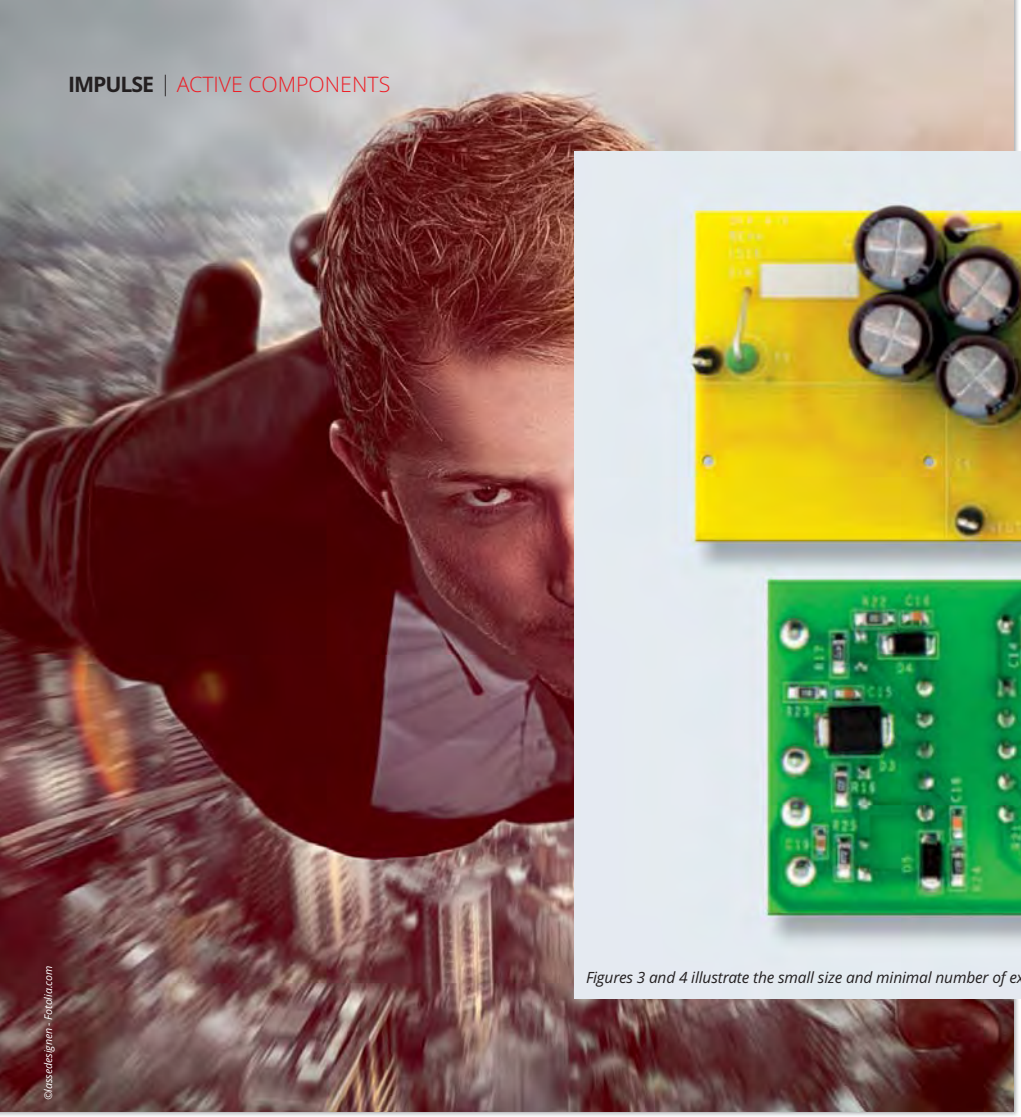
The LinkSwitch-4 controller is also well suited for embedded power supplies in industrial, medical and consumer products where its high efficiency and reliability improve the operating efficiency and MTBF of the power supply.

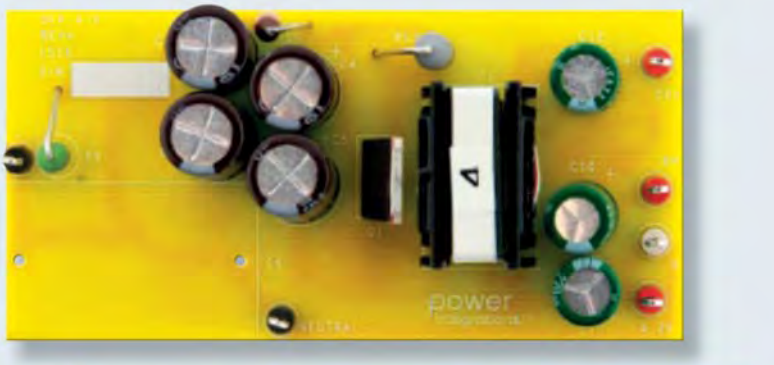
A new design note, DER-479 download at http://ac-dc.power.com/design-support/reference-designs/design-examples/der-479-6-w-11-w-peak-3-output-flyback/ illustrates how devices can be used in an industrial application. This reference design is for a Constant Voltage, non-isolated, primary side regulated, flyback power supply which provides three output rails 4V, 8V and 12V with an overall efficiency in exces of 75%. See Figure 2 for the schematic.

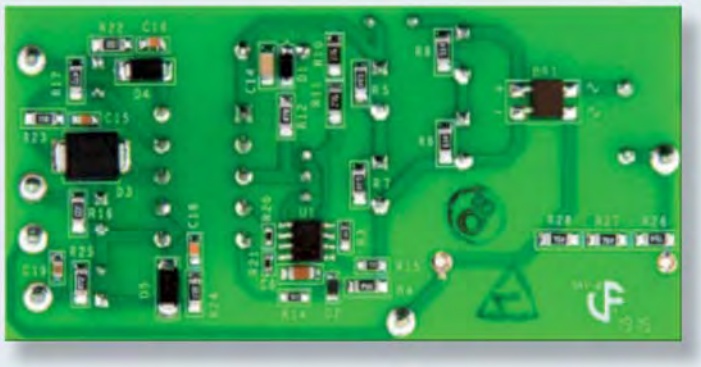
Based around the LinkSwitch-4 LNK4004D, the circuit is designed to operate from 185 - 290VAC, but can withstand 440VAC at full load for an indefinite time, using a high voltage (800V) external BJT such as the BUL216. The input stage consists of a fusible resistor, R9, bridge rectifier, BR1 and smoothing capacitors, which, in conjunction with L1, form a pi filter to reduce differential EMI. Additional EMI filtering can be used on the input (capacitor C6 and resistors R26 - R28 if the environment requires it).

The LNK4004 incorporates a multimode PWM/PFM controller with quasi-resonant switch to maximise efficiency across a wide dynamic load range. It controls both the switch peak current and switching frequency ensuring the part operates in discontinuous mode at all times. Efficiency is also boosted by the use of adaptive base and emitter drive to the external BJT switch, Q1, reducing the losses during switching and driving the transistor hard off. During the on time the emitter is switched to GND via the emitter drive (ED) pin. Base current is controlled to achieve fast turn on and turn off. The controller modulates the base current to the transistor prior to turn off to ensure it is not saturated and can switch off quickly.

The LNK4004D also has an optional Supplementary Base Drive (SBD) pin to provide additional







Figures 3 and 4 illustrate the small size and minimal number of external components required

drive to Q1 allowing a low cost, low gain BJT device to be used or in high power applications where higher base currents are required.

When Q1 is switched off a voltage spike is generated due to primary leakage inductance in the transformer, T1. This transient can damage the switching element unless a voltage clamp is placed across the primary side to protect Q1. Diode D1, resistors R12 and R13 and capacitor C14 perform this function.

The non-isolated regulated outputs are derived from the secondary windings, rectified and filtered via the diodes D3, D4 and D5 and capacitors C10, C12 and C17. Damping networks have also been connected across the rectifier diodes to dampen out the ringing and voltage spikes resulting from the reactance of the secondary windings. The LNK4004 controlled is biased from capacitor C8 which is charged via Q1. When the input voltage is applied resistors R10 and R11 supply current to the base of Q1 which starts to turn on allowing current to flow into the LNK4004D and C8 to charge. Once C8 has reached Vrun (around 12V) the chip enters its initialisation and start up routine.

Output regulation in CV mode is achieved by sensing the secondary supply winding voltage or a dedicated feedback winding voltage. The feedback voltage supplied to the FB pin is used to set and control the output, and is a combination of the feedback resistor potential divider values and turns ratio on the feedback winding.

The POWER INTEGRATIONS design note can be used as the basis of a low power (max 15W) embedded power supply in numerous applications requiring high efficiency, high reliability, small footprint and low cost. Figure 5 illustrates the efficiency plot of for the reference design which has a peak power limit of 7W.

A06

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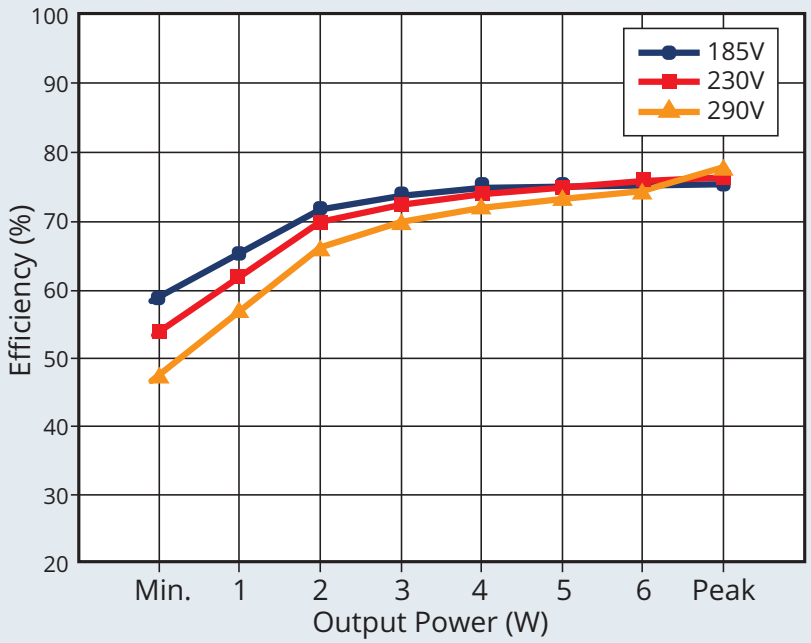
Figure 5: Design note DER-479 efficiency plot



Dualmode Bluetooth SOC for industrial connectivity

BlueCore®

QUALCOMM (former CSR) has launched the BlueCore® CSRB5348 dual-mode system on chip (SoC).

The industrial temperature grade SoC inludes an embedded Bluetooth v4.1 compliant radio, 80MHz RISC MCU, 40MHz DSP and 22 fully configurable digital and 22 analogue I/O for design flexibility. It also offers embedded USB battery charging for lithium cells, 8Mb of embedded ROM, 56k of RAM and the option for memory expansion, up to 64Mb, with a serial Flash memory interface.

In order to help developers bring new products to market quickly, QUALCOMM has launched a dedicated software development kit (SDK) for the CSRB534x series. The new CSRB534x launches with a dedicated development board for fast evaluation and system development. The CSRB534x SDK will allow developers to get hands-on with the new platform and accelerate the development of a range of wireless devices.

It supports SPP and GATT and enables flexible data transfer including HID over GATT. The SDK includes an MFi® V4.0 add on, Android and PC support. There is also a dedicated C-compiler for the Kalimba DSP available.

A07

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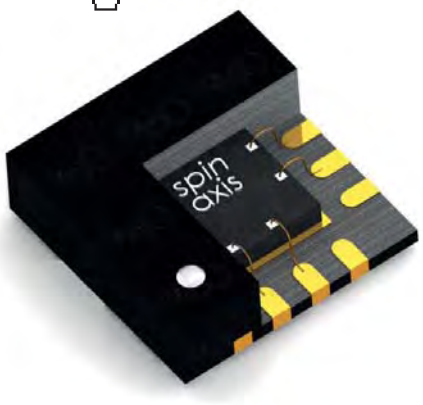
MagAlpha

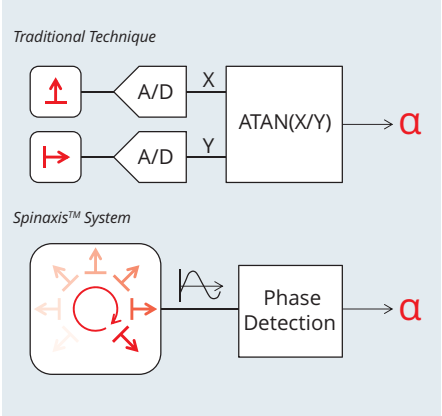
Magnetic Angle Sensors from Spinaxis™-technology!



Following the acquisition of Sensima Technologies in 2014, MPS now offers the MagAlpha range of magnetic angle sensors based on a unique hall sensor technology called Spinaxis. MagAlpha devices contain a single silicon microchip which measures the angular position of a permanent magnet and provides the measured angle directly as a digital number via an SPI bus, or as an incremental ABZ encoder output. Devices are available that also output UVW signals for motor commutation or as PWM for contactless rotary knob/rotary potentiometer implementations.

What is special about Spinaxis?

Magnetic angle sensors are widely used to measure and control positions in electro-mechanical systems, and these sensors have to respond accurately and rapidly to position changes. Spinaxis is a new solution, which does not involve complex calculations or feedback loops with long time constants.



Before the introduction of Spinaxis, conventional hall based systems obtained the angle by converting two analogue levels, representing orthogonal field components, into digital numbers and calculating trigonometric functions. Other systems use an interpolator approach, which is based on a feedback loop. With both methods the data arrives at the sensor output some milliseconds after the position was actually sampled leading to a lag error in the measured versus the true mechanical position.

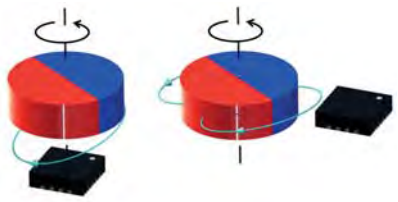
The Spinaxis system is a straightforward way to measure the angle and deliver the digital value, without the need of analogue to digital conversion or feedback loops. It yields instantaneous information about the actual rotor position with low angle lag.

What are the advantages of Spinaxis?

The Spinaxis system allows for accurate and instantaneous detection of the angular position, with the sensor array being sampled continuously at 500KHz, and with a lag from sensor sampling to output reading of only 3us. This results in a device that is capable to support rotation speeds in excess of 100,000 rpm with low angular lag error. Using smart averaging within the device, the MA300 version of the MagAlpha chip is able to deliver up to 12Bit resolution for digital angle readings. Housed in a QFN 3x3mm package, the MagAlpha family provides an extremely compact encoder implementation.

How does Spinaxis work?

The magnetic field is continuously scanned by an integrated array of hall sensor probes in such a way that a sine wave is generated in which the phase represents the angle to be measured. The digital angle is obtained by measuring this phase referenced to the zero crossing of the sine wave signal, i.e. by counting the time between a



End of Shaft Mode *Side of Shaft Mode*

reference edge and the zero crossing of the magnetic field axis. This time-to-digital conversion is performed by the system clock and a counter. A digital angle sample is produced for each 2µs field scan.

Magnet-sensor configurations for angle sensing

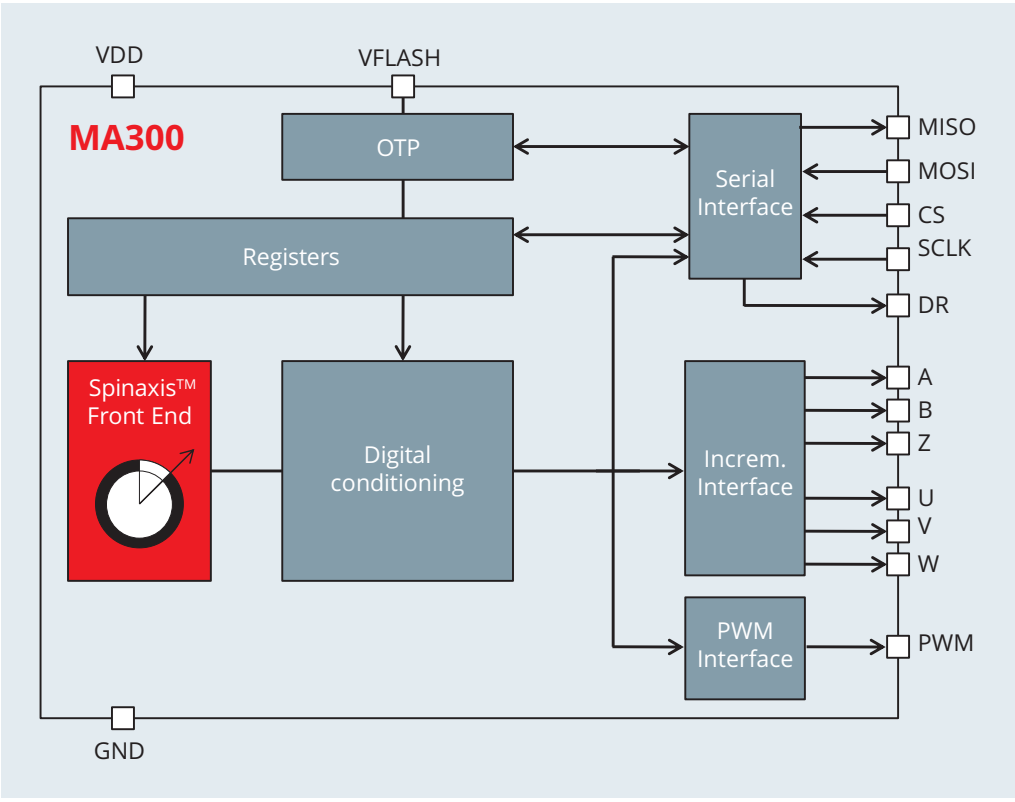
MagAlpha sensors detect the angle of the magnetic field vector projected in the horizontal chip plane. The sensitive area of the device is also much smaller than the external permanent magnet, giving freedom in the sensor-magnet configuration. The zero crossing technique of Spinaxis means that the device can operate with a wide range of magnetic field strengths, typically from 30mT up to 150mT. MagAlpha devices are able to support both End-of-Shaft and Side-of-Shaft mounting of the magnet. They are further able to balance the difference in radial and tangential magnetic fields in Side-of-Shaft mode to give a linearized output.

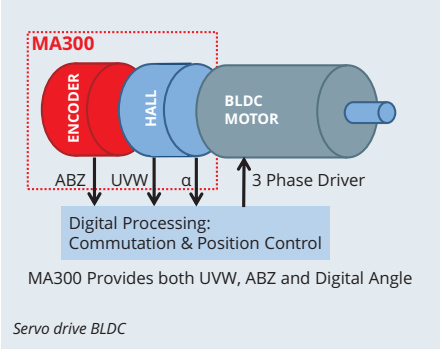
MagAlpha product families and applications

MPS offers three families of MagAlpha device (MA1xx, MA3xx, MA7xx) targeted at different application segments. The MA100 can replace the traditional 3 Hall sensor switch approach to generate the UVW commutation signals at 60 degree intervals, using a simple 2 pole diametrically magnetised disc magnet. This can be advantageous in very small brushless motors where hall sensor to rotor alignment is time consuming. The SPI bus provides 8Bit absolute digital angle information, from which speed can also be computed. The mechanical zero position can also be programmed into the MagAlpha chips via their OTP one time programmable memory. Side shaft mode also allows easier location of the sensor inside the motor or encoder body. For Servo drive applications, the MA300 provides a 10Bit (1024 edges) ABZ encoder output in addition to the commutation signals. Absolute digital angle is also available via the SPI bus with 12Bit resolution.

For Rotary encoder or contactless turning knob applications, the MA700/750 provides absolute output of digital angle via SPI (11/8Bit resolution), as well as ABZ or PWM interfaces.

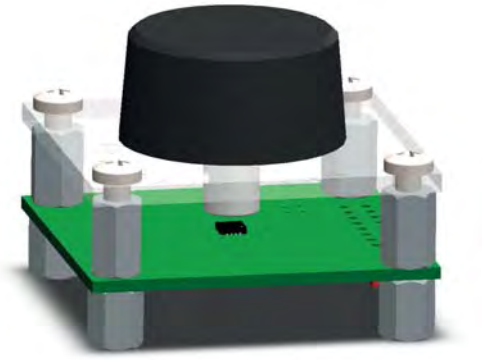
PRODUCT	DESCRIPTION
MA100	Angular Sensor for 3-Phase Brushless Motor Commutation with Side-Shaft Positioning Capability (SPI 8Bit + UVW)
MA120	Angular Sensor for 3-Phase Brushless Motor Commutation (no side shaft)
MA300	Angular Sensor for 3-Phase Brushless Motor Commutation and Position Control with Side-Shaft Positioning Capability (SPI 11Bit + ABZ 10Bit + UVW outputs)
MA700	Angular Sensor for Position Control with Side-Shaft Positioning Capability (SPI 11Bit + ABZ 10Bit)
MA750	Contactless Turning Knob Sensor (SPI 8Bit + PWM 12Bit)





MA300 Provides both UVW, ABZ and Digital Angle

Servo drive BLDC



Contactless turning knob

The 12Bit PWM interface on the MA750 makes it suitable to replace rotary potentiometer applications, and the PWM output can be externally filtered to provide a linear analogue voltage output mimicking the potentiometer.

Magnetic angle sensing is suitable for a diverse range of applications in consumer, industrial and automotive markets and provides a high reliability method of contactless angle, position or speed sensing.

Contact CODICO for full data sheets and further information.

A08

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Music is in the air: Bluetooth 4.2 Audio-Hub

BC127 is the newest generation of fully integrated Dual Mode Bluetooth and Bluetooth Low Energy (BLE) modules.

BC127 comes with an integrated antenna, running all the Bluetooth Stack and Codecs in a very small form factor at 11.8x18mm. It comes Bluetooth, FCC, CE, IC, JRF (Japan) and KC (Korea) certified so users will not need to have to go through Bluetooth certification for the end product.

BC127 is Bluetooth 4.0 certified, offering Bluetooth Low Energy and very low power consumption in every use case (<60mWatts while streaming music, <0.28mWatt connected Idle). Additionally BC127 allows a range of up to 30m connecting with a standard Smart Phone. It also integrates all high quality Audio Codecs such as aptX, aptX-LL, aptX-HD, AAC, MP3 and SBS high definition. In addition the user can configure the module to transmit the Audio received via a high quality integrated Analog Codec (96dB SNR) or directly to a digital interface at a chosen configurable sampling rate.

BC127 comes fully integrated with Melody Software and offers a high level UART command interface that provides full control of all profiles needed such as HFP1.6 (Wide Band Speech HandsFree), A2DP/AVRCP 1.4 (Music Streaming), PBAP (Access to Phone Book) and connects to Android and iOS devices.

A10

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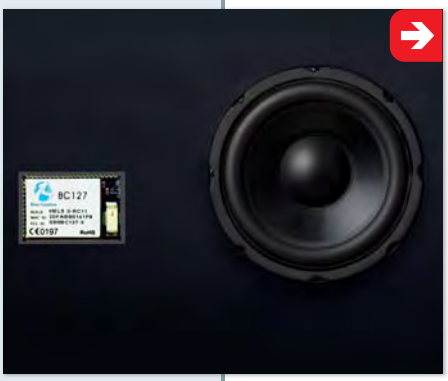
Blue Creation

Smoothly connection to Android- and iOS-Devices!



Mechanical genius!

BC118 is the newest generation of fully integrated Smart Bluetooth modules, produced by the British company BLUECREATION.

BC118 offers ultra-low power consumption, extensive features at a competitive price. It comes with an integrated trace antenna, running all the Bluetooth Stack. The Module is Bluetooth, FCC, CE, IC, JRF (Japan) and KC (Korea) certified, so customers will not need to have to go through Bluetooth certification for the end product.

BC118 is Bluetooth 4.0 certified, offering Bluetooth Low Energy and very low power consumption in every use case. Additionally BC118 allows a range of up to 30m connecting with a standard Smart Phone. BC118 comes with Transparent Data connection, connection with iOS and Android, Central and Peripheral modes, Ability to upgrade firmware over the air, can run standalone or with a host.

Custom BC118 can have the option to have Audio over Smart Bluetooth and also Mesh networking.

A09

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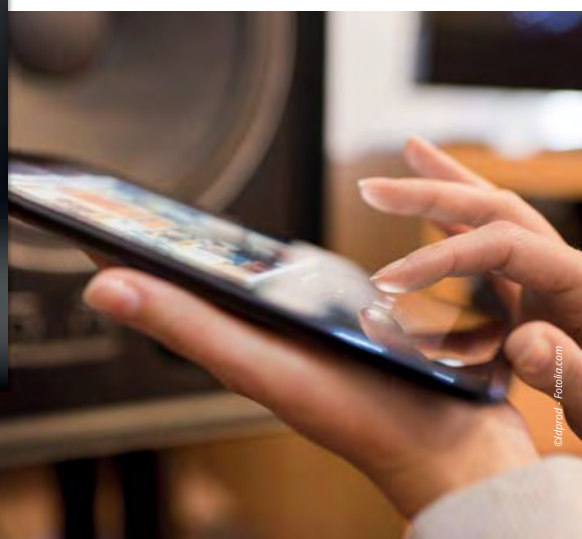
A new generation: BC118 by BLUECREATION!



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Midgets for medical power applications!

RECOM invests further in their medical product portfolio by adding the all new RACM40 and RAM65 series.

Offering 40W and 65W of power respectively, these compact and highly efficient power supplies are available either as open-frame or in a semi-enclosed case. All modules of the RACM family are equipped with two independent protective measures for maximum patient protection (2xMOPP) - a must for safety in medical technology. Both operate with an input voltage range of 85 to 264VAC and deliver 5VDC, 12VDC, 15VDC, 24VDC and 48VDC output voltages, which can be trimmed over a ±10% range to meet the exact requirements of the application. All models feature efficiency of up to 93.5%, require no minimum load and can be used at altitudes of up to 5000m at temperatures between -40°C and +85°C. The output voltages are fully regulated and have tolerances of less than ±0.2% over the entire input voltage range and less than ±0.5% over the entire load range. These space-saving 3"x2" modules offer 4kVAC reinforced isolation between input and output, 2.5kVAC between output and case, and also meet the requirements for medical applications with patient contact (2xMOPP@250VAC working voltage, 8mm creepage & clearance). These modules are approved according to medical safety standard IEC/ES/EN-60601-1 3rd Edition and feature BF-rated outputs with less than 75µA leakage current. All models have a built-in Class B EMI filter and come with 5-year warranty.

A11

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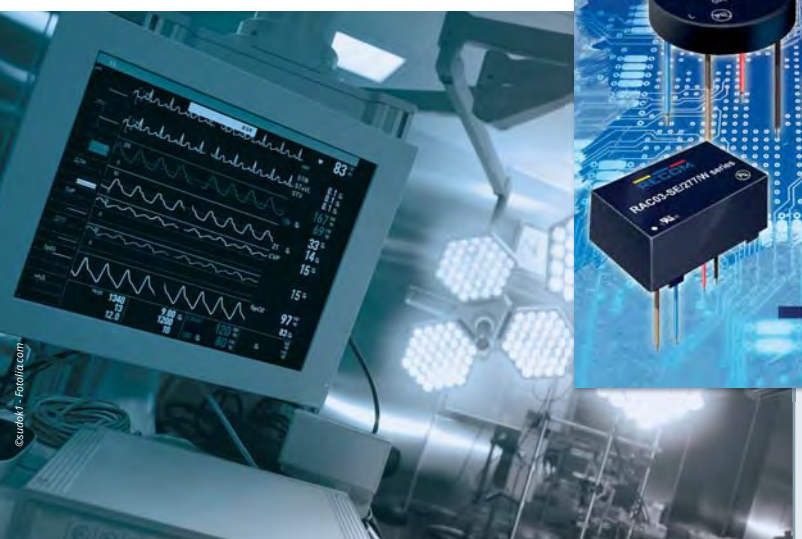

RECOM

Maximal reliability with 5-year warranty!

Qualified as well for aeronautic applications!

Adding further power ratings to the established range of RAC modules, makes the compelling range of AC/DC PCB modules from RECOM worth taking an in-depth look.

The range offers single and dual outputs, covering any standard voltage possible. Nothing special really, however the SE/277 versions of the family make a significant difference after all. The range covers 2-4 Watts – for now – with more to come and offers with single, dual bipolar and non-bipolar outputs 5/12VDC. In addition the modules have a very low stand by power consumption of just 50mW max. (depending on the nominal power rating), making ErP and DOE standards simply irrelevant to the module.

Adding the small letter »E« to the part number makes the product temperature sustainable simply working from -40°C up to +80°C – perfect for any auxiliary power supply waking up the main power supply, especially since there are two voltages available. Another selected feature is the input frequency range from 47 up to 440Hz, allowing the usage of the modules in aeronautics applications. The tiny module takes only 36.7mm by 27.2mm of space on the PCB and makes the wide operating temperature range converter a frosty but reliant partner.

A12

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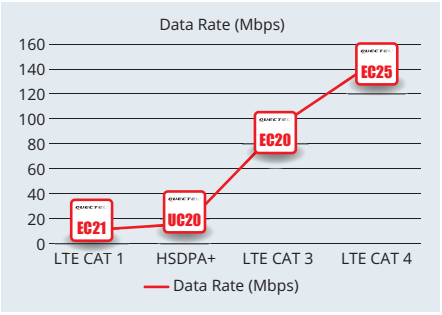
4G-PORTFOLIO EXTENSION

QUECTEL launched two new LTE modules EC21 and EC25 based on the latest Qualcomm® Snapdragon™ X5 LTE modem (9x07).

High integration, simple BOM, low design cost and backwards-compatibility with existing 2G, 3G and 4G networks made them ideally suitable for IoT applications. These two LTE modules will gain great success in the LTE market leveraging on their quality and performance.



EC21-Modul

QUECTEL's EC21 is an LTE Category-1 module optimized specially for M2M and IoT applications. Delivering power-enhanced performance and M2M-optimized speeds of 10Mbit/s down-load and 5M-bit/s uplink, and featuring low-power, low-cost LTE connectivity make it ideally suitable for numerous IoT applications that are not rely on high speed connectivity but still require the longevity and reliability of LTE networks. It is also fallback compatible with QUECTEL UMTS/HSPA+ UC20 module and with others multi-mode LTE module EC20/EC25 in the compact and unified form factor.

EC21 contains 5 variants EC21-V, EC21-A, EC21-E and EC21– AUT/AU which makes it backward-compatible with existing EDGE and GSM/GPRS networks to ensure that it can easily migrate from LTE to 2G or 3G networks.

A rich set of Internet protocols, industry-standard interfaces and abundant functionalities (USB drivers for Windows XP, Windows Vista, Windows 7, Windows 8/8.1, Linux, Android/eCall) extend the applicability of the module to a wide range of M2M applications such as metering, tracking and tracing, fleet management, wearable devices, smart home gateways, digital signs, industrial routers and even drones.

IOT

Check out our new **Sample Shop:** www.codico.com/shop

The EC25 LTE-Cat 4 module is targeted for applications requiring high-speed data with the need for fallback to 3G. The EC21 LTE-Cat 1 module has been specially developed for M2M and IoT applications that are not rely on high speed connectivity but still require the longevity and reliability of LTE networks.

Both modules support Multiple-input multiple-output (MIMO) technology, a cutting edge antenna technology, transmitting multiple data streams on multiple transmitters to multiple receivers. The antennas at each end of the communications circuit are combined to minimize errors and optimize data speed. They also combine high-speed wireless connectivity with embedded multi-constellation high-sensitivity positioning GNSS receiver.

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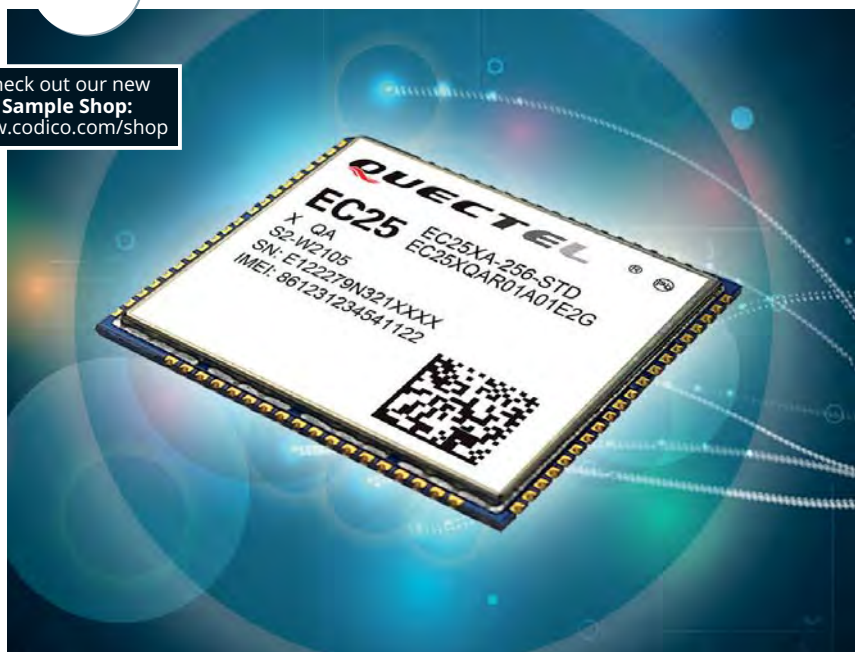

EC25-Modul

The EC25 series is the new generation of QUECTEL's LTE modules. Adopted the 3GPP Rel. 10 LTE technology, it delivers 150Mbps downlink and 50Mbps uplink data rates and is fallback compatible with QUECTEL's UMTS/HSPA+ UC20 module and with the others multi-mode LTE modules EC20/EC21 in the compact and unified form factor, providing a flexible and scalable platform for migrating from UMTS/HSPA+ to LTE.

EC25 contains 7 variants EC25-C,EC25-CE, EC25-E, EC25-AUT, EC25-AU, EC25-V and EC25-A depending of the region, which makes it backward-compatible with existing EDGE and GSM/GPRS networks to ensure that it can connect even in remote areas devoid of 4G or 3G coverage.

A rich set of Internet protocols, industry-standard interfaces and abundant functionalities (USB drivers for Windows XP, Windows Vista, Windows 7, Windows 8/8.1, Linux, Android/eCall) extend the applicability of the module to a wide range of M2M applications such as CPE, router, data card, rugged tablet, automotive, security and industry PDA.

QUICK SPECS

	EC21 – CAT1	EC25 - CAT4
Frequency Bands	EC21-V, EC21-A, EC21-E, EC21– AUT /AU	EC25-C, EC25-CE, EC25-E, EC25-AUT&AU, EC25-V, EC25-A
LTE-Version	3GPP E-UTRA Release 11	3GPP E-UTRA Release 10
Bandwidth	1,4/3/5/10/15/20 MHz	1,4/3/5/10/15/20 MHz
Antenna	DL MIMO 2×2, supports Rx-diversity	DL MIMO 2×2, supports Rx-diversity
Supply Voltage Range	3,4 ~ 4,3V, 3,8 V typ.	3,4 ~ 4,3V, 3,8 V typ.
Operation Temperature	-40°C ~ +85°C	-40°C ~ +85°C
Dimensions	32,0 × 29,0 × 2,4mm, LCC-Package	32,0 × 29,0 × 2,4mm, LCC-Package
Weight	Approx. 4.6g	Approx. 4.6g
Data Rate	**LTE** LTE-FDD: Max 10 MBit/s (DL), Max 5 MBit/s (UL) **DC-HSPA+** Max 42 MBit/s (DL), Max5,76 MBit/s (UL) **UMTS** Max 384 KBit/s (DL), Max 384 KBit/s (UL) **EDGE** Max 236,8 KBit/s (DL), Max 236,8KBit/s (UL) **GPRS** Max 85,6 KBit/s (DL), Max 85,6 KBit/s (UL)	**LTE** LTE-FDD: Max 150 MBit/s (DL), Max 50 MBit/s (UL) LTE-TDD: Max 61 MBit/s (DL), Max18 MBit/s (UL) **DC-HSPA+** Max 42 MBit/s (DL), Max 5,76 MBit/s (UL) **UMTS** Max 384 KBit/s (DL), Max 384 KBit/s (UL) **TD-SCDMA** Max 4,2 MBit/s (DL), Max 2,2 MBit/s (UL) **CDMA** Max 5,4 MBit/s (DL), Max 14,7 MBit/s (UL) **EDGE** Max 236,8 KBit/s (DL), Max 236,8 KBit/s (UL) **GPRS** Max 85,6 KBit/s (DL), Max 85,6 KBit/s (UL)
Interfaces	Digital Audio PCM, USB 2.0 High Speed, UART, USIM, Netlight, ACD, Reset, Antenna, QMI	
Protocols	TCP/UDP/PPP/FTP/HTTP/SMTP/MMS/FTP/SMTP/NTP/PING/DTMF/FILE/CMUX/QMII	

BRIDGE BETWEEN THE WORLDS

The new dLAN® Green PHY eval board II

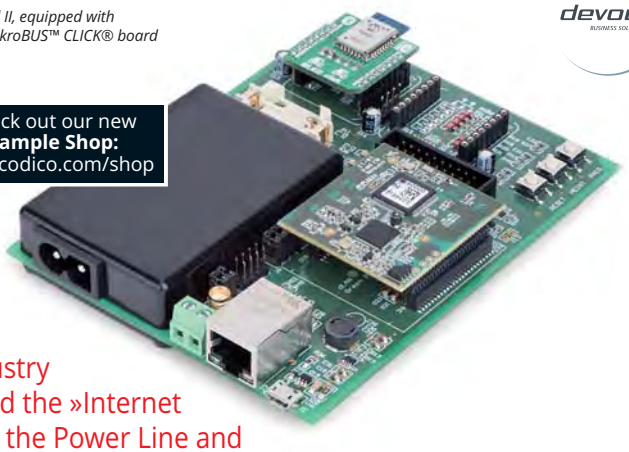

Figure 1: dLAN® Green PHY eval board II, equipped with dLAN® Green PHY module and one mikroBUS™ CLICK® board

In order to better address the current issues of the day in electronic industry like »Industry 4.0« and the »Internet of Things«, DEVOLO - the Power Line and Data Communication specialist out of Aachen, Germany has developed a new development and evaluation platform, the dLAN® Green PHY eval board II. It is based on the dLAN® Green PHY module which is on the market already for a while and which implements the HomePlug Green PHY communication standard.

The idea behind the new board was to connect the sensor and actuator level in an Industry 4.0 application - also known as the field level - faster, easier and more cost-effective with the data center or even directly with the cloud or the internet and so to speak, build a bridge between the field and data processing level.

Even at the Internet of Things is about the same problem to increase connectivity: many of today's solutions for building- and machine control are based on wireless technologies. However, wireless solutions not always provide sufficient coverage. Again, it is important to build bridges. For both applications, Power Line Communication (PLC) almost lends itself. This technology is able to convert the sensor data or control commands out of the field level as well as the home control information into IP data and to transfer them by use of a Power Line signal. The special feature of the DEVOLO technology: the integrated PLC modem is able to transmit the information via the anyway available cables of the electrical wiring.

Alternatively, the PLC signal might be transmitted over any 2 wire connection, independently of the fact that it might be used already for other purposes like AC or DC power supply of equipment. Dead wires, bell wires or even coaxial cables can be used as well. This saves new installation and after installation of cables and thus reduces the installation effort, time and cost. In the same way, data of wireless based networks in factory buildings or in home networks can be tunneled through concrete ceilings and walls and with that increase the connectivity.

Up to now, it was difficult to try and to test all this functionality. The new dLAN® Green PHY eval Board II is made to solve these issues. In order to do so, it is equipped with a number of interfaces and features as well as several options to couple the PLC signal into the wire. A special feature as well is the Software Development Kit provided by DEVOLO, which includes a cloud connectivity.

Features

The most important features are:

- dLAN® Green-PHY Power Line Communication module contained
- coupling of the PLC signal into 110V/230V mains wiring, coaxial cables or 2-wire any wire
- 2 expansion slots for mikroBUS™ standard based CLICK® boards
- Power supply via micro-USB connector
- Ethernet LAN interface (100Mbps)
- Debug interface (JTAG and serial/UART)
- Input/Output pin for general purpose applications (digital or analog)
- 2-wire / I2C interface
- Software Development Kit (SDK) with user guide and numerous sample applications
- Real Time Operating system FreeRTOS™

The block diagram in figure 2 shows the setup of the board and the interfaces in the overview.

An essential innovation of the new evaluation board is the integration of the two mikroBUS™ expansion slots. For now, there are 180 different CLICK® boards on sale from company MikroElektronika (http:/www.mikroe.com/click). They offer to add different areas of technology, e.g. wireless with ZigBee, Bluetooth, ISM, GSM, IR, RFid/NFC and much more. Other categories of available CLICK® boards are sensors, interfaces, mixed signal, audio and voice, human-machine interfaces, motor control etc. and growing fast. All these CLICK® boards are usable with the DEVOLO eval board II.

Their signals can be processed by the freely programmable NXP LPC 1758 processor, integrated in the dLAN® Green PHY module. Afterwards the data can be send over to the Qualcomm Atheros QCA7000 Chip which is integrated in the dLAN® Green PHY module as well and who then transforms the data into a PLC signal ready to be transmitted on any wire to remote stations. User data rates of 5.5Mbps can be achieved and cable length of 300 meters can be reached. The new board allows for direct Ethernet-to-PLC conversion as well.

A comprehensive Software Development Kit as well as two debug interfaces simplify user application development. The SDK contains numerous example code, e.g. for measuring temperature/humidity, control via relay, DALI light control and much more. It as well enables simple connection to the »relayr« Cloud Plattform.

The dLAN® Green PHY eval board II will be delivered with dLAN® Green PHY module mounted, AC cable for PLC signal coupling, Micro-USB-B-cable and Quick Installation Guide.

A detailed data sheet, the SDK together with its user manual and more information are available under the following link:
http://www.DEVOLO.com/de/Business-Solutions/Module/dLAN-Green-PHY-eval-board-II

On request, CODICO is able to provide instructions how to modify the evaluation board in order to use it in electro mobility applications.

You would like to find out more?
We are happy to help!

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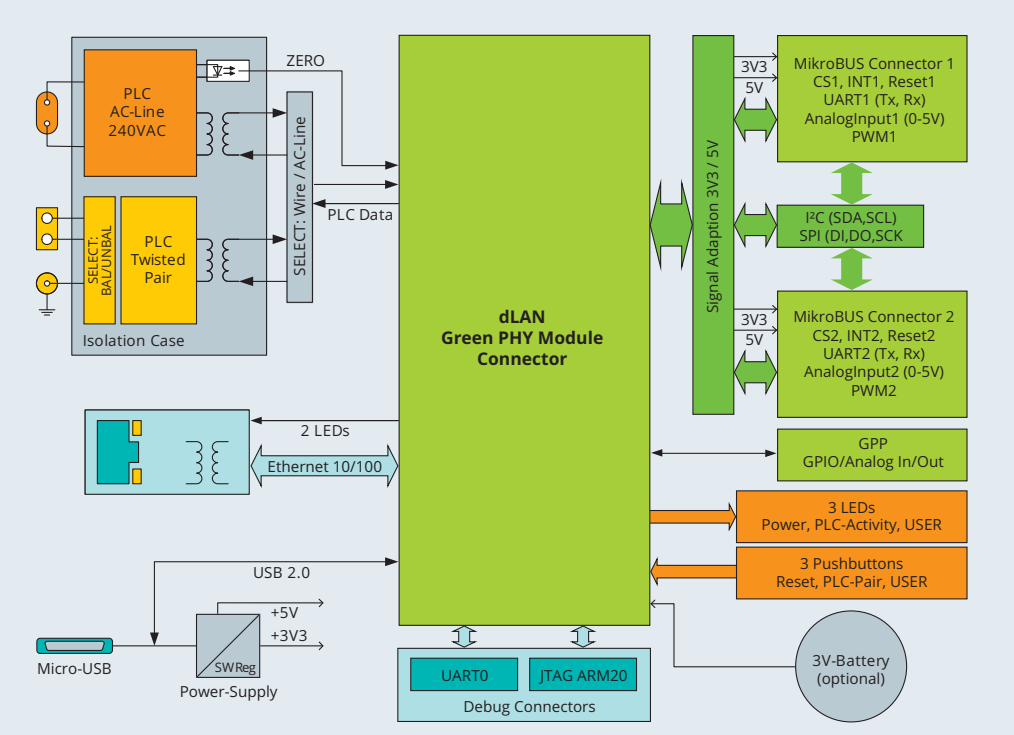
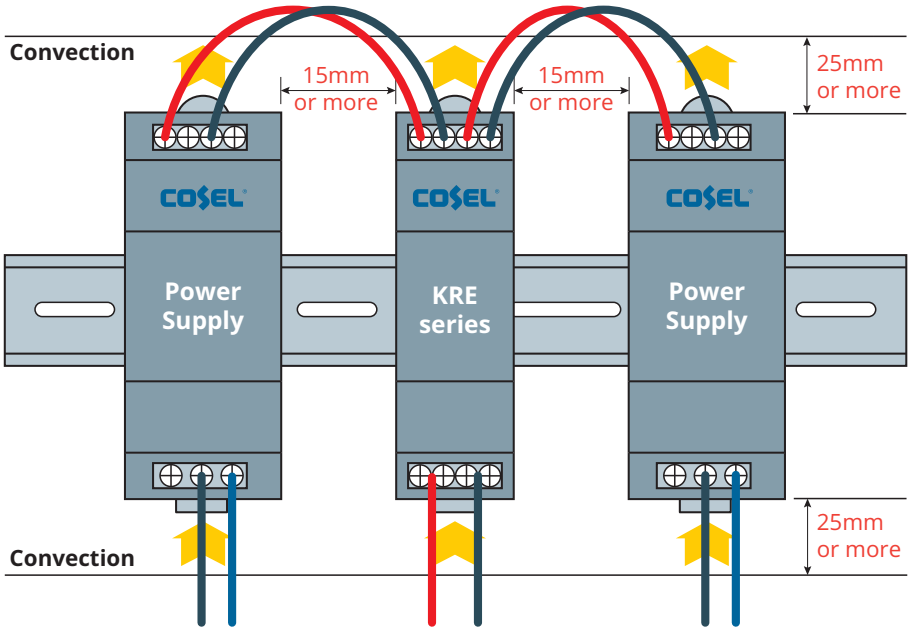


Figure 2: Block diagram of dLAN® Green PHY eval board II

SHARE AND SHARE ALIKE!

COSEL expands their existing Din Rail portfolio with a redundancy module, covering all nominal standard output voltages between 10VDC and 60VDC.

The existing portfolio of Din Rail power supplies now covers power ratings from 30W up to 480W and output voltages from 5VDC up to 48VDC. Although the KHEA and KLEA are perfectly capable to work in series and parallel (on the output), the KRE (redundancy module) will make the application way more stable and more importantly, redundant.



Having more than one power supply working in parallel has usually two root causes. Either the power rating of one power supply is too little or the reliability and/or lifetime is a problem. In case the power rating is insufficient, it is the easiest to take a larger device, since a series operation on the output will simply decrease the MTBF i.e. the reliability.

When working in parallel, the obstacle with more than one unit which of, one cannot bear the total load, is not only the reliability. Moreover the output voltage may drift over time due to temperature, vibration and simple deterioration. A passive or droop current sharing will not work if the voltage difference between the power supplies gets too big, resulting in a system collapse.

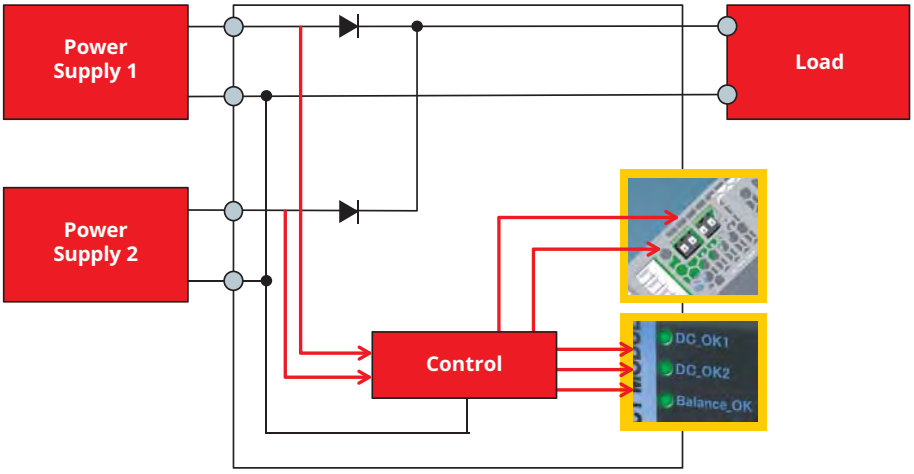
The easiest fix to the reliability issue is to add ORing diodes, given the total output power requirement is lower or max. the output power of one device. This easy amendment will ensure seamless operation even if one of the devices dies for whatever reason, e.g.: an output short.

DINRAIL KH/KL-series

KRE-series (redundancy module)

The KRE module not only includes the ORing diodes, it also balances the output currents, which increases the total lifetime of the complete solution, for two reasons: The load current with every individual power supply is reduced and the temperature rating of the cabinet in which the power supplies are installed can simply be lower since the total surface on which the heat is dissipated, is bigger. The KRE module also comes with a remote DC OK contact given an indication light needs to be installed remotely. The relay contacts have no polarity. When installing the DIN Rail modules an indication light (Balance_OK) will help adjusting the output voltages of every individual power supply.

The family now comes in two power ratings, the KRE-20A with 20A nominal and 30A peak for up to 60VDC in and the KRE-40A for up to 30VDC and 40A nominal with a peak capability of up to 60A. The peak capability is supporting the KHEA family and is restricted to a total peak of 150% with a duration of 5s and a duty cycle of up to 35%. The redundancy module is a reliability feature to increase the overall lifetime of an installation for the standard DIN rail family to share and share alike!



Model Name		KRE-20A	KRE-40A
Input	Voltage	24VDCtyp (10VDC-60VDC)	24VDCtyp (10VDC-30VDC)
	Current	10A(×2)	20A(×2)
Output	Current	20A	40A
	Peak Current	30A 5s (Dutymax 35%)	60A 5s (Dutymax 35%)
Signal		DC_OK (LED and Relay Contact) Balance LED	
Operating Temp.		-25 to +70°C	
Approval		UL60950-1,C-UL(CSA60950-1) EN60950-1,UL508	
Size	W	38mm	
	H	124mm	
	D	117mm	

It does help to reinforce this image that the products all come with a five year warranty – the power supplies as much as the redundancy module.

A15

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COMPEX

WiFi PCIe modules for industrial applications

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COMPEX can look back at 10 years of cooperation with QUALCOMM ATHEROS, and specializes exclusively in the latter's WiFi modules. COMPEX is thus an official ADC (authorized design centre) of QUALCOMM ATHEROS and, in addition to innovative reference designs, also offers its customers the corresponding hardware and software development support.

Its main focus, however, is the development and manufacturing of PCIe WiFi modules in various mechanical and functional designs. These modules are partly based on the original reference designs of QUALCOMM ATHEROS, though some are COMPEX's own developments.

As a rule, the company offers PCI express mini cards measuring 30mm x 50.95 mm (full size) or a smaller 30mm x 26.80mm (half size) design with a 52-pin connector. Despite the fact that many users demand and prefer the smaller »half size« design, the increasing complexity of today's WiFi standards no longer allows for a design implementation on such small cards. Therefore, COMPEX offers most of its modules as full-size cards.

In some module designs with multiple antenna technology, such as MIMO4x4, or even in high-power designs, COMPEX had to resort to oversizes such as, e.g. 50x50.95mm or 50.3x70.3 x5.5mm to make room for the large number of components required. COMPEX offers all modules with an extended commercial temperature range

of -20°C to +70°C. Since COMPEX focuses on industrial applications, some of these are also available in the industrial temperature range of -40°C to +70°C, using exclusively components with a full industrial qualification. The limited temperature range of +70°C instead of the usual +85°C can be explained as follows: Almost all components of a module are hidden underneath a shield to suppress incoming and outgoing EM wave radiation. Naturally, the temperature inside the shield is higher as a result of the components' self-heating. Therefore, the external temperature should not exceed +70°C over extended periods. COMPEX, however, uses the following wording for al I-temp modules: *»The module can operate up to 90°C. For long term reliability, a 20°C safety margin should be maintained.«*

As regards WiFi standards, the modules tick all the boxes. The product range covers all single and dual band solutions in several antenna configurations. In single band, the 802.11b/g/n standards are available in MIMO 2x2 or 4x4. At 5GHz, the 802.11ac/an standards are supported in the MIMO 2x2, 3x3 and 4x4 configurations. Dual band solutions offer either 802.11a/b/g/n standards or with the 11ac extension in the MIMO 2x2 and 3x3 antenna configurations. In the case of the dual band modules, however, one must take into account that only one band can be covered at a time, i.e. it is not possible to use both bands simultaneously.

A great advantage of COMPEX is that almost all modules are both CE-certified (for Europe) and FCC-certified (for the US). Some of them even offer IC (for Canada). All modules are supported either by both Linux and Windows or by one of the two. The following summary offers a small overview of the module solutions. To download a complete product matrix including datasheets, go to: http://downloads.codico.com/misc/AEH/COMPEX

For further inquiries, please contact

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PART NUMBER	WLE200N2	WLE200N2-23	WLE600V5-27ESD	WLE200NX-I	WLE600VX-I	WLE900VX-I
						
Standard	802.11 b/g/n	802.11 b/g/n	802.11ac/n	802.11a/b/g/n	802.11a/b/g/n/ac	802.11a/b/g/n/ac
Band	2.4GHz	2.4GHz	5GHz	2.4GHz & 5GHz	2.4GHz & 5GHz	2.4GHz & 5GHz
MIMO	2x2	2x2	2x2	2x2	2x2	3x3
Chipset	AR9287	AR9283	QCA9882	AR9280	QCA9892	QCA9890
Interface	PCIe 1.1	PCIe 1.1	PCIe 1.1	PCIe 1.1	PCIe 1.1	PCIe 1.1
Voltage	3.3V	3.3V	5V	3.3V	3.3V	3.3V
Power (Per Chain)	16dBm	23dBm	5GHz @ 23dBm	18dBm	2.4GHz@2dBm/ 5GHz@20dBm	2.4GHz@21dBm/ 5GHz@20dBm
Power Consumption	1.9W	2.5W	7.5W	2.7W	3.5W	5W
Receiver Sensitivity	-95dBm@6Mbps	-96dBm@6Mbps	-94dBm@6Mbps	-94dBm@6Mbps	-94dBm@6Mbps	-94dBm@6Mbps
Antenna Connector	2 x U.FL	2 x U.FL	2 x MMCX	2 x U.FL	2 x U.FL	3 x U.FL
Temperature Range	-20°C to +70°C	-20°C to +70°C	-20°C to +70°C	-40°C to +70°C*	-40°C to +70°C*	-40°C to +70°C*
Dimension (mm)	26.8 x 30 x 3.45 (H x W x D)	50.95 x 30 x 3.2 (H x W x D)	50.95 x 50 x 3.2 (H x W x D)	50.95 x 30 x 3.2 (H x W x D)	50.95 x 30 x 3.2 (H x W x D)	50.95 x 30 x 3.2 (H x W x D)
RoHS Compliance	yes	yes	yes	yes	yes	yes
Certifications	CE, FCC, IC	FCC	CE, FCC, IC	CE, FCC, IC	CE, FCC	CE, FCC, IC
Reference Design	HB97	Compex Design	Compex Design	XB92	Compex Design	XB140
Linux Support	Atheros Reference Driver, ath9k	Atheros Reference Driver, ath9k	Atheros Reference Driver, ath10k	Atheros Reference Driver, ath9k	Atheros Reference Driver, ath10k	Atheros Reference Driver, ath10k
Windows Support	8.1, 7, Vista, XP, 2000	8.1, 7, Vista, XP, 2000	Not Available	8.1, 7, Vista, XP, 2000	Not Available	Not Available

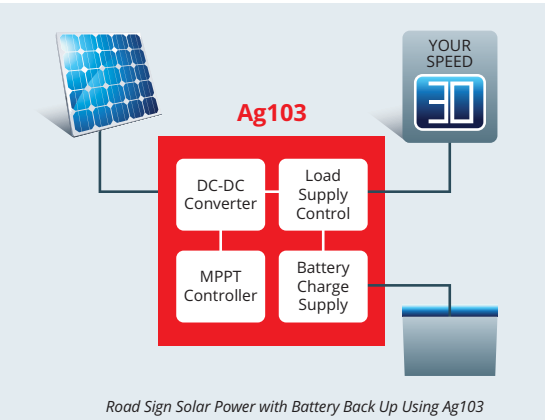
**The module can operate up to 90°C. For long term reliability, a 20°C safety margin should be maintained.*

ENERGY HARVESTING FOR EVERYBODY

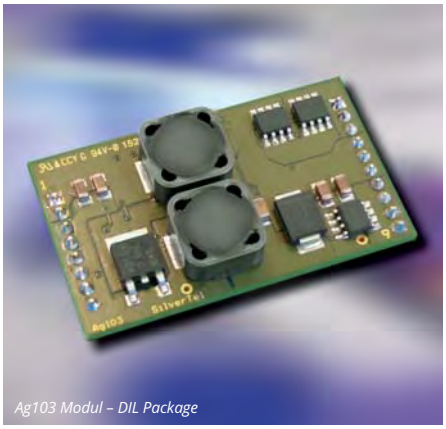
Silvertel

There are many modern trends in electronics such as developments for the IOT, but energy harvesting is another key area for technological innovation and product development.

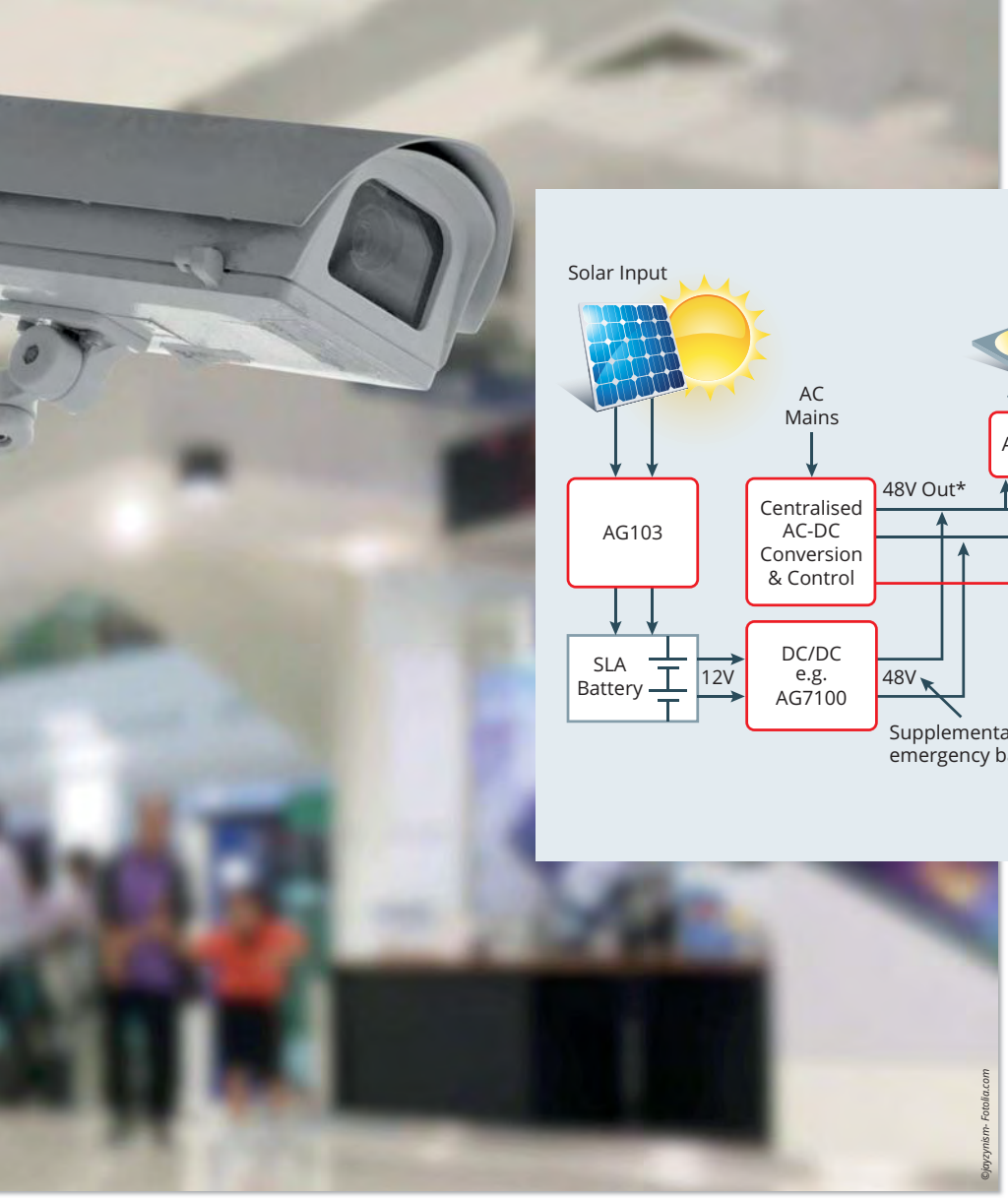
The push towards renewable energy is moving away from simple large scale mains electricity generation sources such as wind farms, to small scale local and off-grid applications. SILVERTEL has been very active in both the IOT and energy harvesting fields in recent months with further plans for complementary developments in the future. For example, solar power compatibility has long been an issue with the existing SILVERTEL Ag102 sealed lead acid (SLA) battery chargers. With the push towards more use of renewable energy, Ag103 was designed to fill this solar panel input compatibility gap in the SILVERTEL battery charger range. Applications like roadside speed signs; remote, outdoor and emergency lighting systems; standalone secure access enclosures (e.g. for bicycles); IOT remote sensor systems and security cameras all require a reliable source of power or back up. As these applications become more commonplace, a simple solution for charging solar batteries while maximising both, the available power from the solar panels and the battery lifetime through intelligent charging techniques, is required. Ag103 has been specifically designed for use with Solar Panels in the range from 5W to 50W output power to charge compatible Solar Batteries of capacity from 1.2Ah up to a maximum of 28Ah. With a host of features including Maximum Power Point Tracking to fully capitalise on the available energy from the Solar Panel, deep discharge protection and multi stage charging (constant current, constant voltage, float) including adaptive initial bulk charge for speedy charging, Ag103 is a perfect and easy to integrate solution for energy harvesting solar power while maximising solar battery lifetime and minimising charge times. To show how the Ag103 could be used to help source

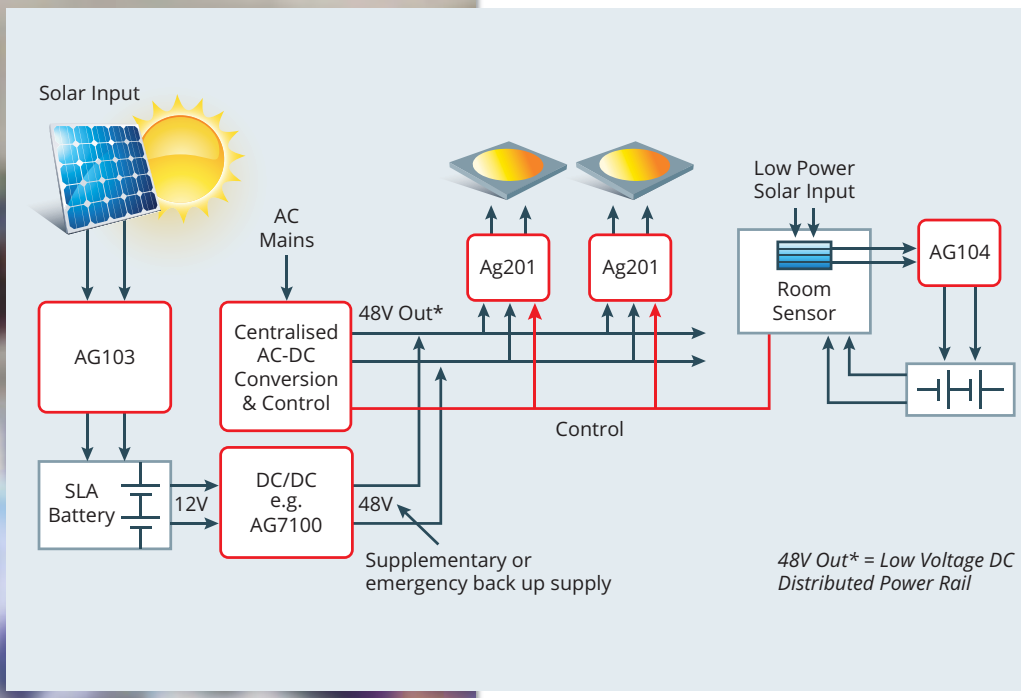


Road Sign Solar Power with Battery Back Up Using Ag103

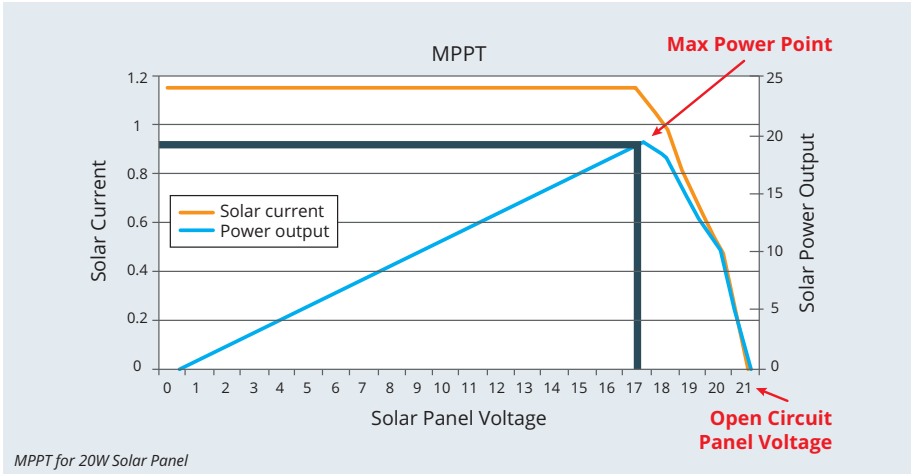


Ag103 Modul – DIL Package

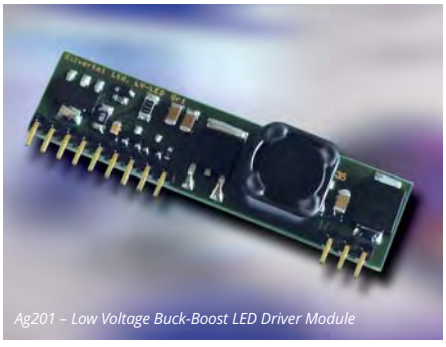




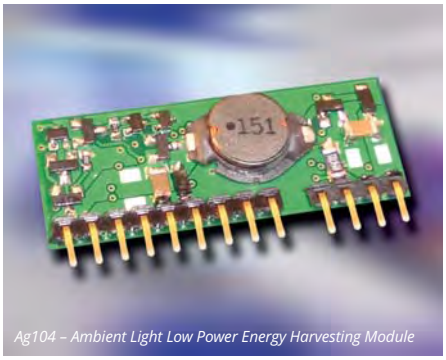
back-up power when linked to a solar panel, as part of a modern Low voltage power distribution system, an example of a complete lighting system, including emergency lighting, with solar power back up, plus sensors and controls, incorporating low voltage DC distribution is shown in the application diagram. This includes several of SILVERTEL's latest and planned developments, as part of a roadmap to produce a linked module set for energy harvesting and the IOT. Low voltage power distribution systems are another growing trend to improve safety and allow easy integration of back-up power and lighting systems, while allowing a single efficient centralised point for AC/DC conversion. Ag104 has been designed to take over where Ag103 finishes, in the 0 to 5W power range. Ag104 is perfect for low power devices for example, making use of low level and ambient light to charge a local battery or super capacitor to power home automation sensors and switches for example in lighting systems. Ag201 has been designed to meet the requirements of the new trends for low voltage power distribution in lighting systems, with maximum flexibility in terms of input and output voltage and multiple programmable settings for the constant current output.



MPPT for 20W Solar Panel



Ag201 – Low Voltage Buck-Boost LED Driver Module



Ag104 – Ambient Light Low Power Energy Harvesting Module

A17

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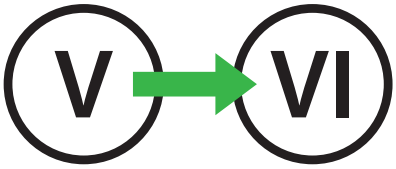
POWER TO COMMODITIES!

Supplying power to the board does not necessarily require additional bold connectors that are just there for »the power«. Apart of wireless charging according to the Qi standard of the WPC (Wireless Power Consortium), PoE standardized in the IEEE802a.f/a.t allowing a total power of up to 100 Watt (HDBaseT) and more, also USB technology has evolved over time.

Where as the first USB standard from the mid 90s was designed to supply computer peripherals with a simple 5V@500mA voltage source it has become so much more than that, today.

Compliant with the latest USB Power Delivery V2.0 Specification, the new family of USB 3.1 Type-C adapters has 4 output power levels - 15W, 18W, 36W & 45W. The 15W model follows USB PD Profile 1 with 3A output (5V/3A), while the 18W follows USB PD Profile 2 with 5V/3A output and it supports automatic sensing and switching between 5V & 12V output voltages (5V/3A, 12V/1.5A). The 36W model follows USB 3.1 PD profile 3 with 3A for 5V output (5V/3A, 12V/3A), while the 45W model adds 20V output voltage to profile 3 and switch between 3 output voltages - 5V, 12V & 20V (5V/3A, 12V/3A, 20V/2.25A). Both the 36W and 45W models support automatic sensing and switching between output voltages. As such, all these 4 models are capable of charging both Chromebook™ and MacBook® computers.

PHIHONG has now introduced a new family of highly efficient USB3.1 power adapters with Type C receptacles that are suited for powering and charging a wide variety of electronic devices and peripherals, including mobile phones, tablets, notebook computers, Type-C docking stations, Type-C battery bank, monitors, and high end storage/video multimedia devices. Pretty much any device that requires a data interface and an external power source even tough just to charge up an internal battery. The new family of USB 3.1 wall plug adapters features wide input voltages and the latest USB 3.1 Type-C receptacle, which allows users to plug the USB Type-C cable in whichever way they would like, eliminating frustrating connection attempts since the new USB plug is symmetrical and can be used bottom – up.



The new USB 3.1 Type-C adapters meet US Department of Energy (DOE) Level VI and European Union Code of Conduct (CoC) V5 Tier 2 high-efficiency standards. They are also certified to IEC/EN/UL 60950-1 safety specifications and have built-in over-voltage, over-current, short-circuit, and over-temperature protections.

All new USB 3.1 Type-C adapters are available in US and EU plugs. The 15W/18W measure 40mm x 52mm x 23.3mm and the 36W/45W measure 67mm x 46.7mm x 29mm. Operating temperatures for the series span 0 to +45°C.

A18

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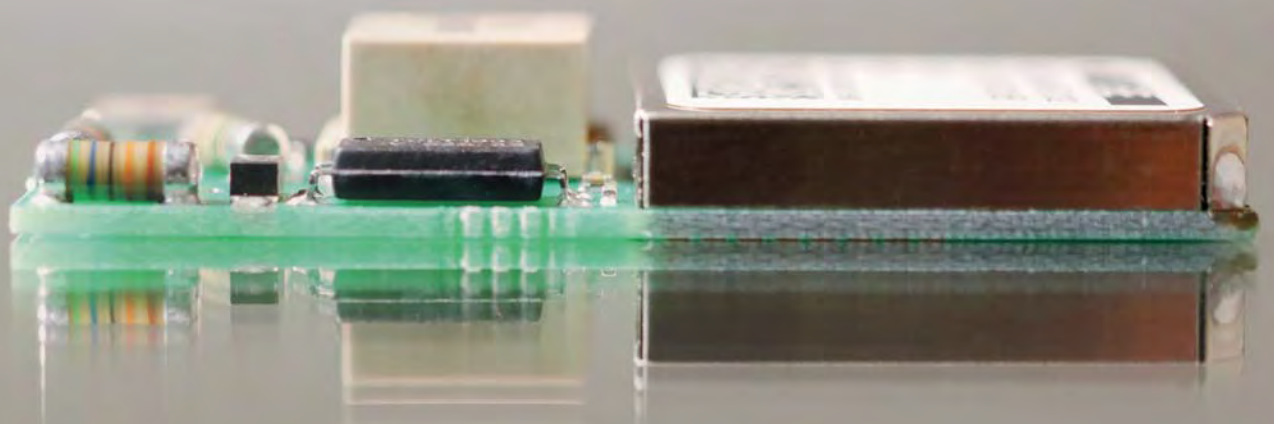
POWERLINE MODULES SINGLE SIDED MOUNTED

PLC Stamp Micro 2 module



The current HomePlug Green Phy modules «Stamp mini« and »PLC Stamp micro« which are available from CODICO already for a while, did have components populated on both sides of their printed circuit boards (PCB). In order to use these modules in customer boards the customer board has to have a cut out area where the mini or micro components fit in. This not only was complex and expensive but also created a slot radiator for the frequencies used in HomePlug Green Phy, which are in the area of 2MHz up to 28MHz.

Now both modules have been reworked and the components have been brought onto one side of their PCB only. With that, the new modules PLC Stamp Mini 2 and PLC Stamp Micro 2 now can be used without cut out area in the customer PCB and can be soldered like ordinary Surface Mount Devices. Pictures 1 and 2 show the new PLC Stamp Mini 2 module and picture 3 the new PLC Stamp Micro 2 module. As of now, both modules are available from stock from CODICO. Both modules »PLC Stamp mini 2« and »PLC Stamp micro 2« are available in 24 different variants each, which differentiate in the Qualcomm IC they have on board, their operating temperature range, interface support, configuration file and other features. CODICO will stock a standard version of each only. All other variants will be available on customer request only.

PLC Stamp Mini 2 module

As a reminder:

Both modules are based on the HomePlug Green PHY Standard and convert TCP/IP based data into a Power Line Signal which then can be transmitted over any given wire. This is not limited to power line only and can e.g. be bell wires, DC powered lines or coax cables. Both modules are either populated with the Qualcomm Powerline IC QCA7000 in commercial or industrial temperature range or alternatively with the QCA7005. Compared with the PLC Stamp micro 2 the PLC Stamp mini 2 module contain the signal transformer for line coupling, which the PLC Stamp micro 2 does not contain. Both modules allow to transmit a UDP data rate of about 5.5Mbps on a cable length of about 300m whereas the cable length achievable is very much depend from the cable used and its installation.

A19

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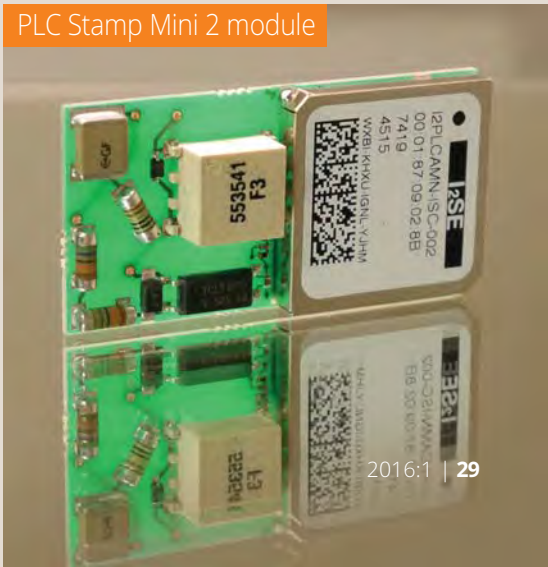
PLC Stamp Mini 2 module



MICRO DC/DCs – THE XCL SERIES

Designers are always looking for more integrated solutions for their new designs. The new TOREX Micro DC/DC switcher family will bring them many benefits including smaller solution size, fewer external components and improved system reliability. With this in mind, TOREX has developed a range of Micro DC/DC converters with integrated Inductors in a small form factor.

Figure 2

The XCL series of Micro DC/DC converters from TOREX Semiconductor use innovative construction techniques whereby a synchronous DC/DC converter IC is embedded within a fully shielded Thin-Film or Multilayer Power Inductor. The simplicity of the XCL construction means that in addition to being space saving, the XCL family is designed to minimise EMI emissions and radiated noise which, together with the extended +105°C operating temperature range, makes them ideal solutions for the industrial market. The reason for the low EMI is all related to the innovative construction method used to create the Micro DC/DC. They take an existing TOREX DC/DC and put it in a 0.4mm ultra low profile USP-6EL package. This is then combined with a custom made inductor which fits on top of the DC/DC. The simplicity of the design means that it is cost effective to manufacture, whilst still providing amazing performance benefits (see Figure 1).

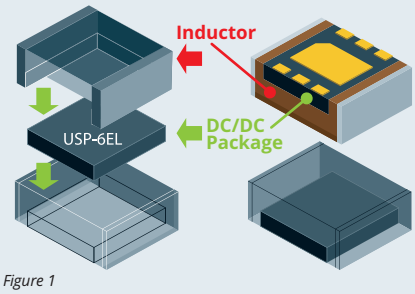


Figure 1

Measuring only 2.5mm×2.0mm, h=1.0mm these Micro DC/DC need only two capacitors connected externally to generate a stable and efficient power supply making them very easy to use: The total solution only takes up 18mm² of PCB space!

TOREX has two different manufacturing partners for the coils. The original partner supplies them with a Thin Film coil and more recently they have introduced a second supplier that is able to provide them with a Multilayer coil with the same electrical characteristics. Having two suppliers ensures that TOREX will always have a continuous supply.

Micro DC/DC Benefits

To illustrate some of the benefits of the Micro DC/DC we will now compare them to a standard TOREX synchronous buck DC/DC series with external inductor, the XC9235/36, in terms of EMI & load transient response performance.

Low EMI / Radiated Noise

EMI issues can be resolved with TOREX's innovative Micro DC/DC solutions! When using a DC/DC converter, there is always a concern about noise. The structure of the Micro DC/DC is designed in a way that the inductor covers the DC/DC converter IC, enabling suppression of externally emitted noise. As such, TOREX Micro DC/DC offer much lower radiated noise, compared with a normal DC/DC IC with an external coil. The data in Figure 3 shows the excellent EMI performance of the XCL202, a 6V 400mA synchronous step-down Micro DC/DC and compares it to the XC9236, a 6V 600mA synchronous step-down DC/DC with external inductor.

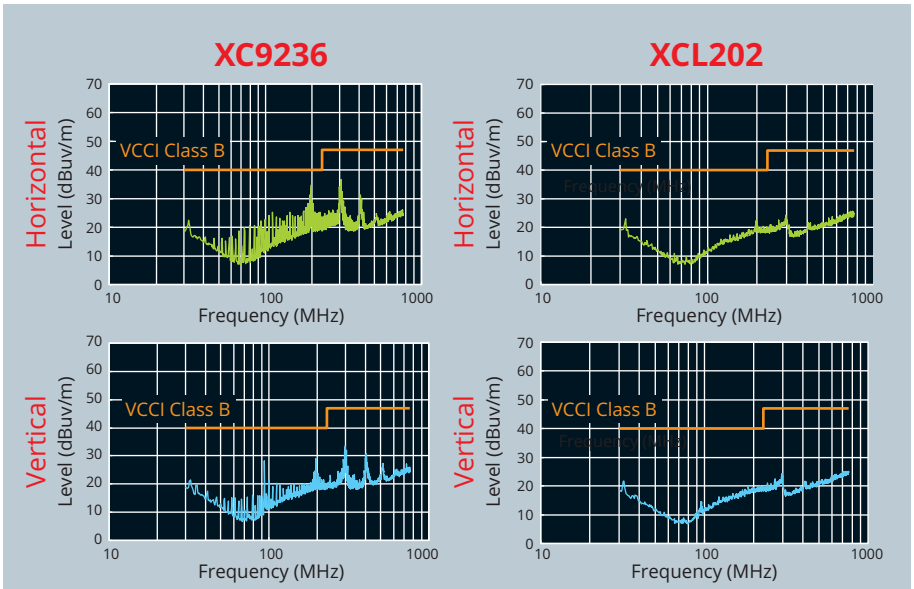


Figure 3

SERIES	XCL210	XCL201/02	XCL221/22	XCL205/6/7	XCL219/20	XCL101
Type	Buck					Boost
Output Current	200mA	400mA	500mA	600mA	1.0A	100mA
Quiescent Current	0.5µA	15µA	15µA	21µA	40µA	6.3µA
Switching Frequency	PFM	1.2MHz	1.2MHz	3.0MHz	3.0MHz	PFM
Operating Temp. Range	85˚C	85˚C	105˚C	85˚C	105˚C	85˚C

Figure 5

High Speed Load Transient Response

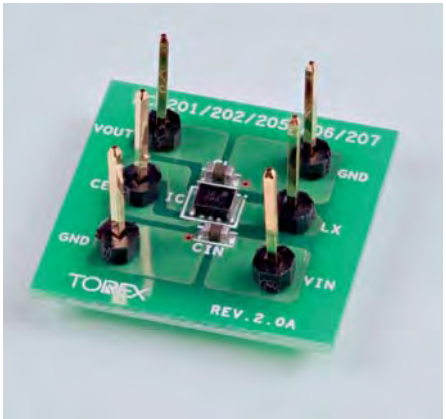
The XCL219 is not only the world's smallest 1A Micro DC/DC but thanks to Hi-SAT COT, TOREX's Constant ON Time architecture, the series provides ultra fast load transient response when compared to a standard synchronous buck DC/DClike our XC9235 which uses a traditional architecture: As you can see from Figure 4, the undershoot and overshoot during the transient load dumps are up to 4.5 times better with the Hi-SAT COT XCL219 and the recovery times are up to 19 times faster than the standard XC9235! Another important advantage of Hi-SAT COT, which can be found with the XCL219, is that it provides less fluctuation in oscillation frequency against load and input voltage. In other words, the switching frequency of the XCL219 is very stable across the load range.

Solutions to Meet all Requirements

Figure 5 shows our full range of 2.5mm x 2.0mm x 1.0mm Micro DC/DC. These devices operate up to 6.0V (5.5V with the XCL219/220/221/222) and not only provide excellent EMI performance but they also provide solutions for ultra low power (the XCL210 consumes only 0.5uA in operation), output currents up to 1A (XCL219/220) and a boost option, the XCL101, which operates from 0.9V. All available in the same package style! In addition, our latest Micro DC/DC are now specified to an operating temperature of +105°C, making them an ideal solutions to replace inefficient LDOs on next generation applications.

For higher current requirements TOREX also offers the XCL213/214 (1.5A) and XCL211/212 (2A) which have a slightly different package construction (see TOREX website for details) and later this year, TOREX will be introducing their very first 18V Micro DC/DC! If you want an even smaller solution than 2.5mm x 2.0mm x 1.0mm, TOREX will soon be introducing a tiny buck DC/DC which measures only 2.25mm x 1.5mm x 0.8mm!

TOREX Micro DC/DC EVBs can now be ordered via the CODICO Sample Shop:
https://www.codico.com/shop/en/semiconductor-ics/power-management/dc-dc-ic-modules.html



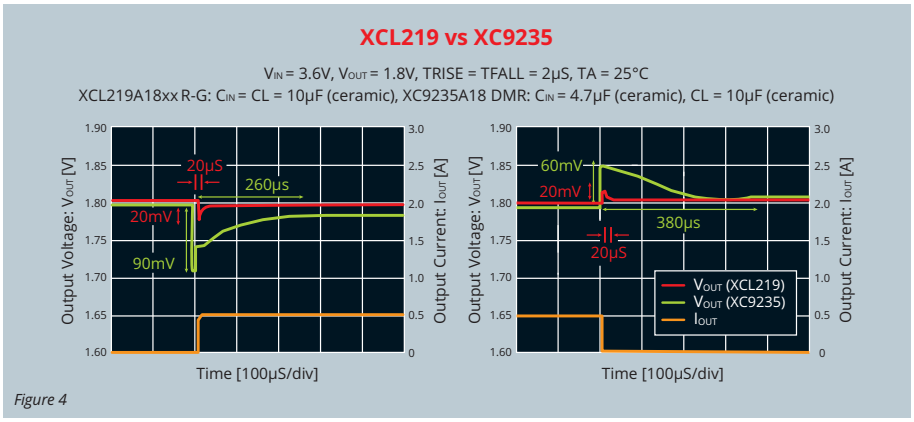


Figure 4

A20

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Custom Monochrome LCDs

UNIQUE DESIGNS

They are still out there: Custom made monochrome LCDs continue to cover a broad range of applications and defy the colour display trend in many cases. Our long term supplier, YEEBO DISPLAY LTD., offers all the common monochrome display technologies and therefore addresses every potential application.

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A variety of applications, which have been solved in the past by a small number of LEDs or 7-segment LED displays, demand for a LCD display nowadays. The number of status messages as well as the need for a simple menu navigation in many cases means the end for the simple LED display. Now the question arises, what display technology to be chosen? Not for any application a TFT solution fits. Power-saving handheld designs, for example, won't support the backlighting of a TFT with more than 300mW (average power consumption of a 2.8 to 3.5 TFTs). An equal, transflective monochrome LCD needs about the half power and turns of the backlight completely, in case there is enough ambient light available. In addition to the low power consumption, the simple software effort is another advantage. Both parameters simplify your design and provide corresponding cost savings. Likewise, means a completely custom monochrome display a relatively small amount of tooling cost. Only a fraction of the cost of an injection molding tool of your housing, or a custom TFT, are sufficient to generate a unique design.

For simple status information, LCD »glasses« are enough. Here we speak of reflective segment LCDs, which do not include any logic and backlight, wired via pins or conductive rubbers. So-called LCMs (Liquid Crystal Modules) are available for solutions with an appropriate controller, usually offered as a COG (Chip On Glass) or COB (Chip On Board) solutions. The backlight can be single-colour, but also designed using RGB LEDs. Whether the display content is visible with or without a backlight, is decided by choosing the different type of polarizer. Transmissive LCDs can be read using a backlight only, reflective solutions at enough ambient light, while transflective types combine the options mentioned.

The trend towards the touch panel isn't only focused on TFTs. Many monochrome displays are equipped with a custom resistive, but also capacitive, touch solution. It's easy to see that the monochromes don't compromise with their »big brother« in terms of usability.

The final visual impression is specified by the chosen LCD technology. Starting with TN (Twisted Nematic), about HTN, STN, FSTN, DSTN, to ASTN (Automotive Super TN) and VA (Vertical Alignment). Starting with some greyscales, up to deep black background and high contrast for the automotive industry. Together with YEEBO DISPLAY we have the right partner for your custom display solution!

A21

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Panasonic

STRENGTHENING OF CO-OPERATION

PANASONIC Automotive & Industrial Systems Europe (PAISEU) offers a unique range of technical knowledge and expertise to leading automotive manufacturers, industrial customers, and OEMS. As a traditional Japanese company, for close on 100 years Panasonic has been developing and producing electronic components, equipment, and modules, making a major contribution to industrial innovations and synergy effects. And, as well as its extensive product portfolio, PANASONIC also offers individualized complete solutions for a vast range of industrial applications.

With the takeover of SANYO, the co-operation between Panasonic and CODICO originally began only with polymer capacitors. Since then we have steadily increased our range with further products, and so extended and intensified the partnership. The choice of the appropriate components has been made in this context in such a way as to match our design activities on our target markets, and as supplements tailored to our existing linecard. We sell solutions, not article numbers. Following on here, and on the next pages, we will be providing you with more details of some of the key products and innovative technologies concerned.

Wide selection of polymer capacitors

Electronics engineers want small, flat components, with longer lifetime, high rated temperature and voltage values, and high stability over time and temperature. In additon, better energy storage and discharge functions for battery-less energy-harvesting applications are becoming more and more in demand. Polymer capacitors are characterized by particularly low internal equivalent series resistances (ESR), with values down to less than 10mΩ and very high ripple current capability. Al-polymer capacitors feature a significantly longer lifetime than aluminium electrolyte capacitors with liquid electrolytes, and show a stable frequency behaviour over the full temperature range.

Compared with tantalum electrolyte capacitors, they do not need any voltage load reduction, present no fire risk, and, compared with MLCC capacitors, they do not show any microphonics. Thanks to these characteristics, the number of components required can be reduced drastically, or, simply, large case sizes can be replaced by significantly smaller ones.

Metal Alloy Inductors

PANASONIC has a wide range of power inductors. CODICO puts the focus on metal alloy technology. The metal composite powder inductors have relevant benefits and offer magnificent DC bias features, high current capability and reliability as well as the ability to withstand high vibration. With the metal alloy technology and structure, PANASONIC is able to cover the automotive market applications, started from interior (e.g. infotainment and connectivity systems, etc.) up to engine systems, as well as DC/DC converters, embedded computers, home appliances, and renewable energy.

Resistors

Precision and measurement resistors from PANASONIC are coming to be used more and more when the demand is for high quality, reliability, and long service life. In the automotive sector in particular, but in industrial and power electronics as well, energy measurement, telecommunications, and medical technology, resistors from Panasonic are being used on a grand scale. CODICO is proud to be able to offer resistors from Panasonic, and so extend the existing portfolio of passive elements.

Electromechanics

PANASONIC, the world's largest manufacturer of switches, supplies all electronics markets with its ranges of switch, and encoder products. The areas of application extend from consumer electronics and white goods, such as electric toothbrushes, AV equipment, mobile telephones, and washing machines to the automotive sector. In that context, tactile switches are used, for example, at steering wheels, air-conditioning systems, and keyless entry systems.

P01

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LIGHT TOUCH SWITCHES

Improved Input Applications

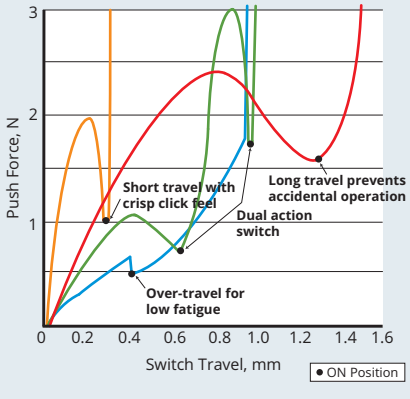
PANASONIC supplies all electronics markets with its product range of Light Touch Switches – and they have been doing so for more than 30 years.

The secret to success lies in the high flexibility which PANASONIC can provide with regard to individual switch requirements, and in the technical know-how which allows them to provide solutions for even the most demanding applications. Many engineers incorrectly regard switches as purely mass goods which can be ordered from the catalogue. The choice of a long-life switch, which gives users a real sense of trust and comfort with regard to their application, depends on a series of factors:

The right proportion of force and travel

An important part in the operating element sector is played by the haptics, the sense of touch and feeling, which can be adjusted just as the customer wishes. When it comes to the haptic experience for tactile switches, the primary concern is to focus on the actuation force which is intended should take effect on the switch. Every tactile switch has individual characteristics, which can be expressed, among other things, in the click ratio (see Figure). The click ratio describes the resistance which can be felt, and which takes effect during use. The higher the click ratio, the crisper and more dynamic the sensation from the switch. Portable entertainment electronics in most cases require a relatively high click ratio and shorter travel proportions (short stroke). Applications from the automotive sector, by contrast, often call for longer travel paths (long stroke), so that unintentional actuation can be avoided.

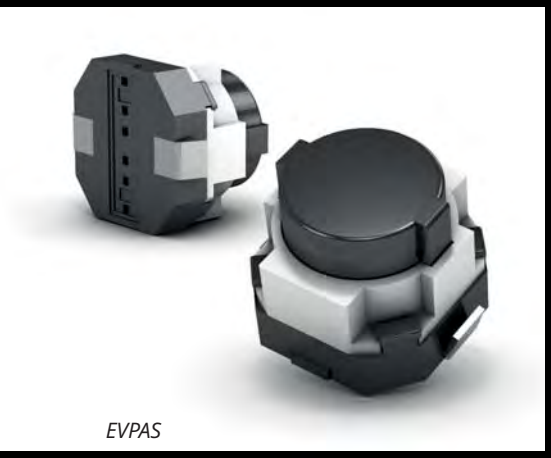
Light Touch Switch Feel



To summarise: A switch is not just a switch. Rather, every input application must create a balanced, individual force-travel experience.

Protection thanks to patented laser-welding process

Tactile Switches for consumer electronics and medical applications are required to function reliably and safely for many years, even under the

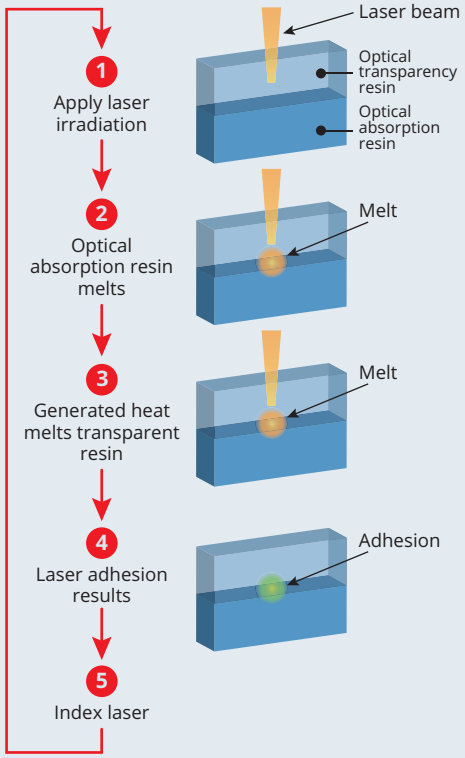


EVPAS

EVPAW

EVQOL

Laser Welding Process



toughest environmental conditions. That means protection must be guaranteed against the unwanted ingress of water, vapours, moisture, dust, and other sources of contamination.

These requirements are specified by protection mode IP 67 for the housings of switches. Usually, an adhesive-secured silicone membrane is used for this. Silicone ages relatively quickly, and in the course of time it also loses elasticity. For the production of their IP 67 Tactile Switches, PANASONIC uses a patented laser welding process, with which the switch is sealed with a thin nylon film, applied over the switch actuator.

The advantages of this method over a silicone membrane are:

1. Safeguarding the haptic effect

The laser welding process has a negligible effect, close to nothing, on the actuation force, and therefore the click ratio. To cite one example: The click ratio of 70.15% changes minimally after the laser welding process, specifically to 68.28%. This means there is a minimal change of less than 2%.

2. Safeguarding against transverse forces

When the nylon film is applied over the switch actuator, transverse forces are likewise preempted, which protects the switch against manifestations of wear.

However pleasant the haptic effects of a switch may be, all the more important it becomes to guarantee that it functions reliably and perfectly for the whole duration of its application. As a rule, high-quality switches guarantee a service life from 100,000 to up to a million switching cycles. Exactly like the force-travel ratio, the average service life for each switch is recorded on the datasheet.

P02

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Nowadays the market design trends and requirements are becoming more and more demanding, especially the automotive area. Downsizing and excellent performance characteristics are gaining big importance from day to day. To fulfil the requested demands of high power and high efficiency, Panasonic developed and introduced the power choke coil series »ETQP«.

Panasonic

LOW PROFILE – HIGH PERFORMANCE

Easily explained: ETQP is a metal composite power inductor technology based on an iron powder material and silicon binder. Due to the metal composite structure, the metal alloy inductor can be used in many circuit applications by achieving high current representatives, low power consumption, high vibration capability and miniaturization. These power choke coils also have very low audible noise and are extremely efficient with low DCR.

The diagram shown in figure 1 describes the most important performance advantages of the ETQP series over a similar ferrite coil by comparing inductance values over bias current as well as inductance over temperature. Once DC bias has reached a certain point, the ferrite unit inductance drops drastically.

Due to advantages of its new metal magnetic powder, the ETQP shows far more stable performance when being exposed to high current along with high temperature stability.

The ETQP-Series illustrates also low power loss over high frequencies than conventional wire wound ferrite coils (see figure 2). Additionally, a downsizing about 20-40% with similar performance can be achieved. The metal alloy power choke secures thereby space saving and high efficiency.

Features

We have summarized for you the most important figures and the relevant parameters:

- Inductance range is specified between 0.33µH and 100µH
- Saturation current is ranging from 3A to 59.4A
- Component sizes are from 5mm to 10mm available
- Component height is from 3mm to 6mm available
- Temperature range - 40°C to + 150°C
- Suitable for high switching frequencies
- High reliability
- Compact and robust design
- AEC-Q200 qualified
- ETQP*M* Automotive
- ETQP*W* Non-Automotive
- SMD version

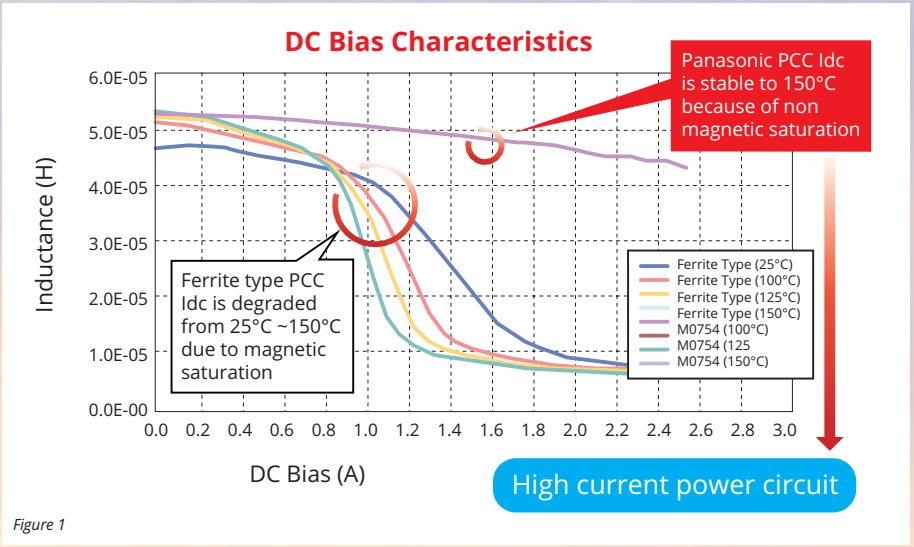


Figure 1

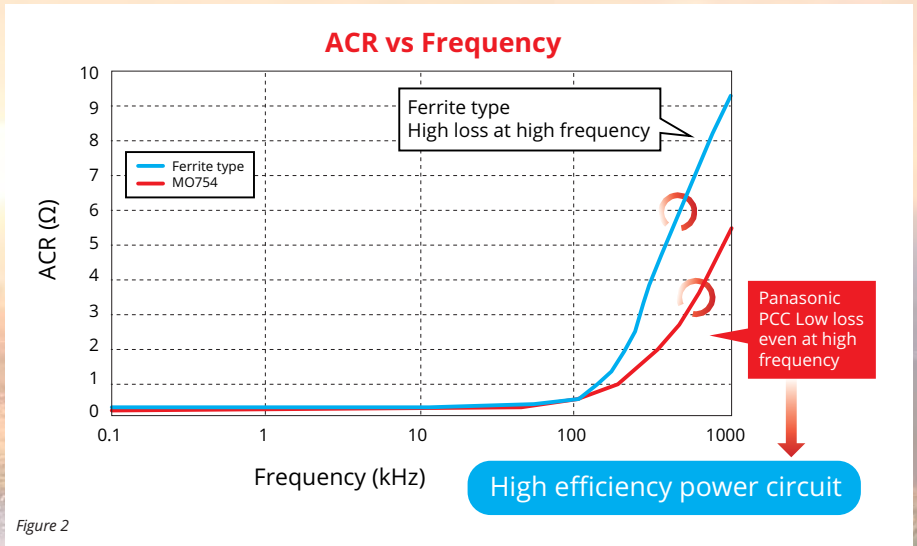
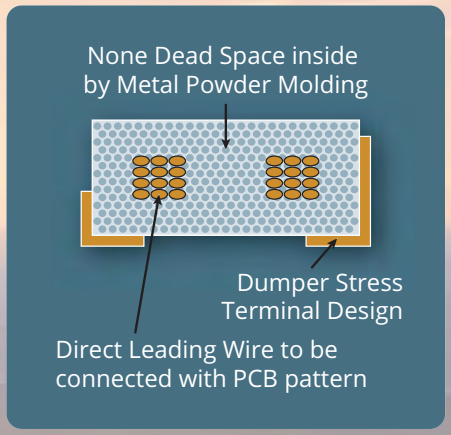


Figure 2

Applications

- Automotive industry (Engine ECI, Start-stop, Airbag, ABS, LED Lighting, Camera System, EPS etc.)
- Motor noise suppression
- LED drivers
- DC-DC converter for navigation, instrumentation, entertainment systems, etc.
- Home appliance
- Renewable energy
- Smart Metering
- Embedded computer

Structure



P03

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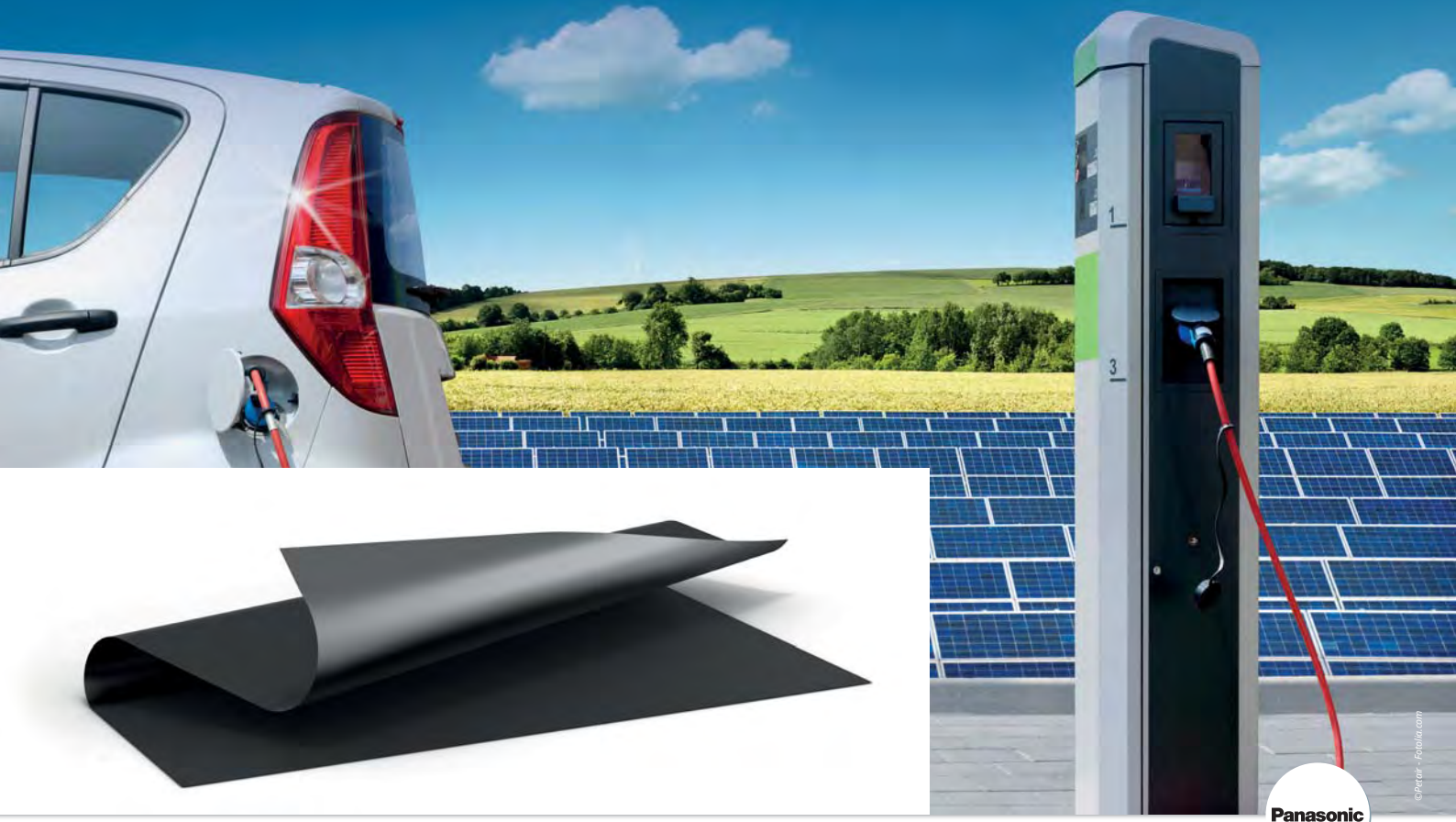
NEW, ULTRA-LIGHT GRAPHITE INTERFACE



Panasonic

Heat is a killer for electronic systems. As applications get thinner and lighter, this statement has never been more true, yet space and weight restrictions mean that conventional solutions may not be feasible.

But it's not just consumer products such as smartphones, tablets and cameras that are at risk. Communications infrastructure equipment cram more and more complex electronics systems into a small space; electric (Eco) and hybrid cars require long-lasting, lightweight batteries; the advent of the smart factory (Industry 4.0) calls for greater levels of monitoring and control; solar panels (ironically) need to be able to cope with constant exposure to the sun; modern medical devices must be able to be worn comfortably. All these examples require heat to be transferred or dispersed effectively, using a minimum amount of space. Pyrolytic Graphite Sheet (PGS) is a new, ultra-light graphite interface film material, developed by PANASONIC, which has a thermal conductivity up to five times greater than copper. It is pliable enough to be cut and folded into complex three dimensional shapes then simply stuck onto the heat source to diffuse the heat or provide a path for heat to flow to a cold wall.

What is PGS?

Pyrolytic Highly Oriented Graphite Sheet is made of graphite with a structure that is close to a single crystal. It is produced from polymeric film using a heat de-composition process. The hexagonal crystal structure of graphite is arranged uniformly in a horizontal 2D structure (see fig. 1).

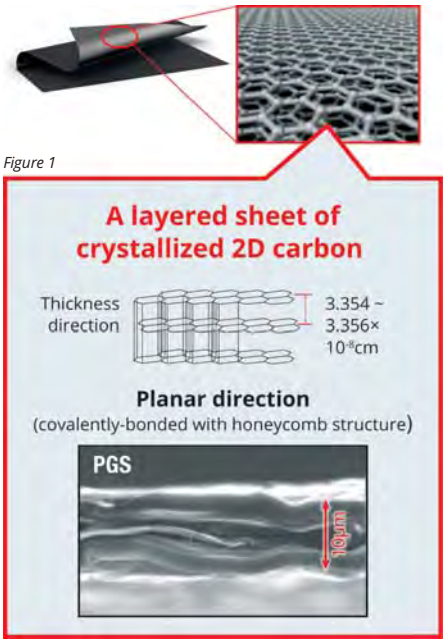


Figure 1

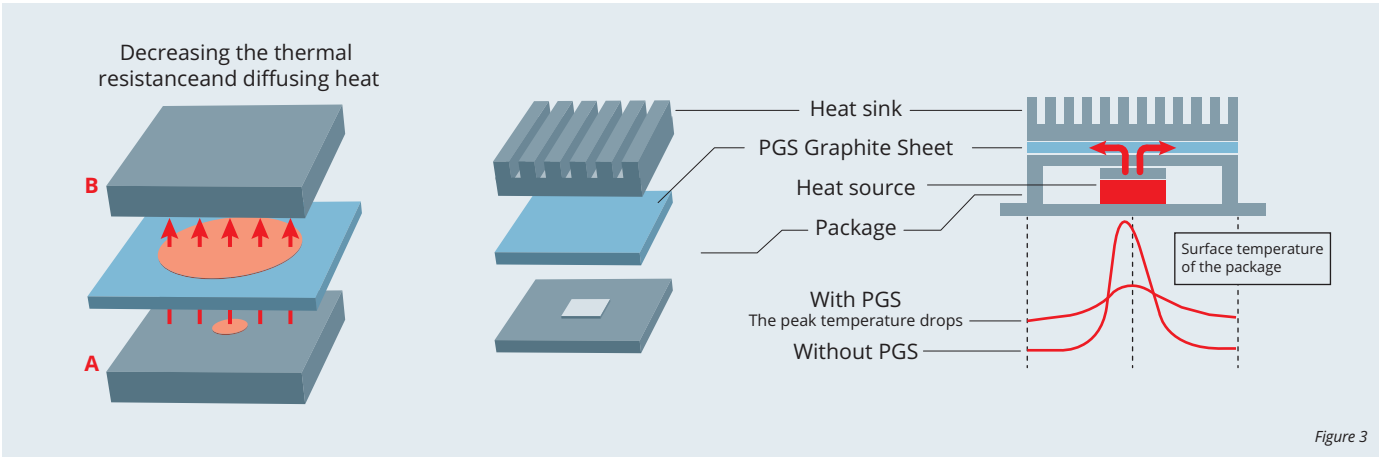


Figure 3

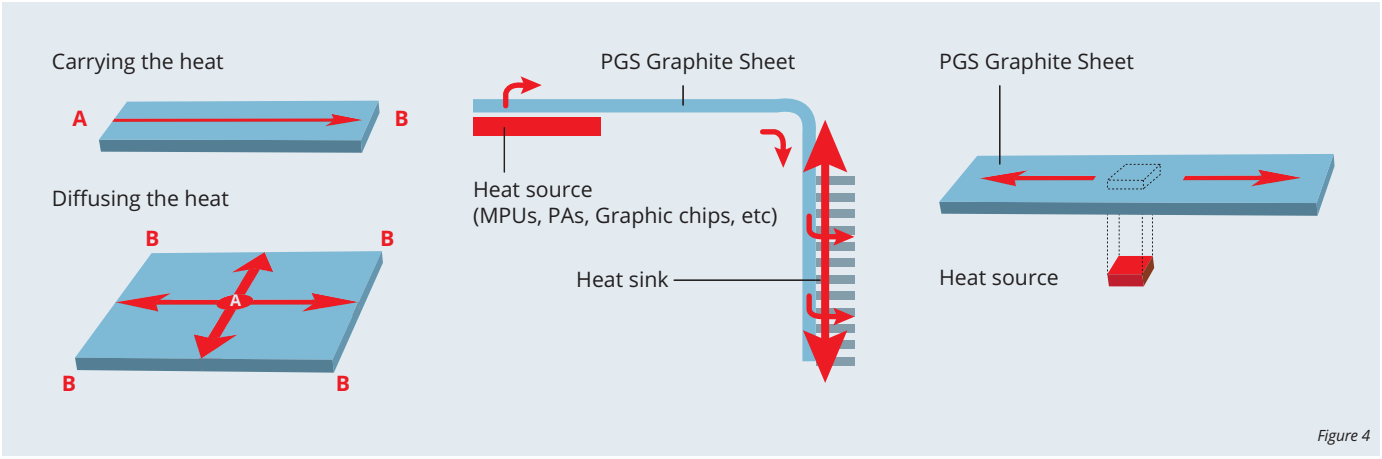


Figure 4

Features

PGS has a number of features which make it highly suitable as an easy-to-use, space-saving, thermal management solution.

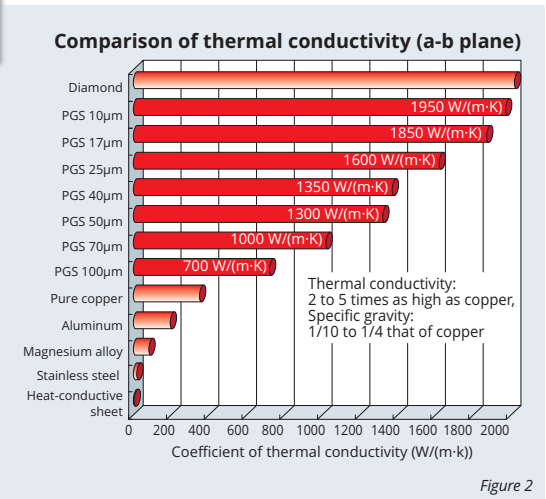


Figure 2

It is very thin and has excellent thermal conductivity from 700 to 1.950W/m·K (depends on the thickness) which is two to five times higher than copper and up to seven times better than aluminum (see figure 2). It can be used as a highly-efficient thermal interface material as in figure 3. It is flexible and pliable so it can be easily cut and folded into a complex shape. With a bend radius or 2mm, sheets can be bent through 180 degrees more than 3,000 times, and its thermal conductivity is unaffected if sharp folds are avoided; the material is very stable so it is resistant to environmental effects and shows no deterioration with age.

PGS film is used to transfer heat away from a heat source, or to diffuse or spread heat away from a hot spot (A>B) as shown in figure 4.

The efficacy of PGS in reducing IC hot spot temperatures is demonstrated in figure 5.

The temperatures at the ABS (Acrylnitril-Butadien-Styrol) surface, the IC and the PCB are shown for two different 70µm thick PGS sheet size.

P04

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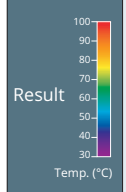
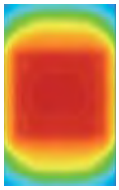
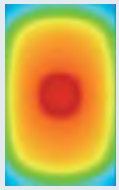
Figure 5

Heat distribution of the ABS surface with PGS70: Diffused the heat and broke the heat spot

		Type A	Type A-1	Type A-2	Type B	Type B-1	Type B-2
Model		ABS / Silicon / IC / PWB	PGS / Insulated film	PGS		PGS	PGS
PGS size (mm)		without	25x40x0.07 (Large)	25x25x0.07 (Small)	without	25x40x0.07 (Large)	25x25x0.07 (Small)
Silicon		with	with	with	without	without	without
Result							
Temp. (°C)	Surface	99.85	83.84	89.08	93.65	77.17	80.86
	IC	101.9	88.89 (-13.0)	93.26 (-8.6)	103.2	99.76	100.96
	PWB	96.25	85.31	89.06	97.26	94.19	95.31

POLYMER-CAPACITORS

Panasonic

PANASONIC offers a great selection of different technologies of polymer capacitors, which provide different advantages depending on the application.

We have already mentioned some of the technical characteristics and advantage in our introductory report on PANASONIC. Thanks to these, you might be able to reduce appreciably the number of components needed, or simply replace large case sizes significantly by perceptibly smaller ones.

Here is a list which summarises these features

- Extremely low ESR and extremely high ripple current capability in small case sizes
- ESR almost stable over the whole temperature range
- Stable frequency characteristics over the whole temperature range
- No DC bias effect (in comparison with ceramic capacitors)
- No noise generation (in comparison with ceramic capacitors)
- No voltage derating to be taken into account (in comparison with tantalum capacitors)
- No flame risk in case of failure (in comparison with tantalum capacitors)

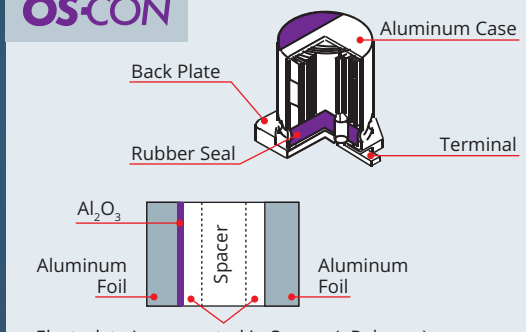
Depending on the application and the requirements, there are three different technologies of polymer capacitors with different specifications for you to choose, present to you as follows:

OS-CON

- Aluminium-polymer
- Wound structure
- Lower prize
- High voltages

Voltage range	2V ~ 100V
Capacitance range	3,3uF ~ 2.700uF
Temperature range	-55°C ~ +125°C
ESR	down to 5mOhm
Ripple current	up to 7.2 Arms
Lifetime	up to 2.000h at 125°C
Diameter	4mm ~ 10mm
Height	4,4mm ~ 13mm

OS-CON

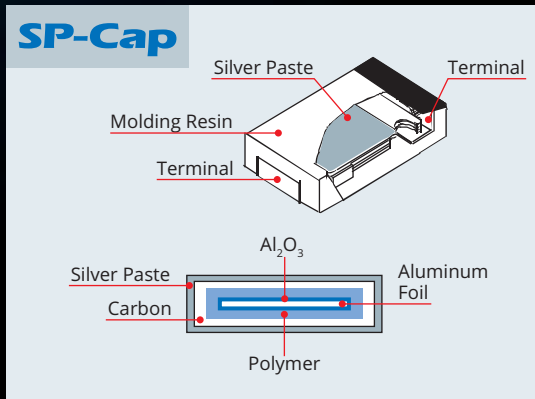


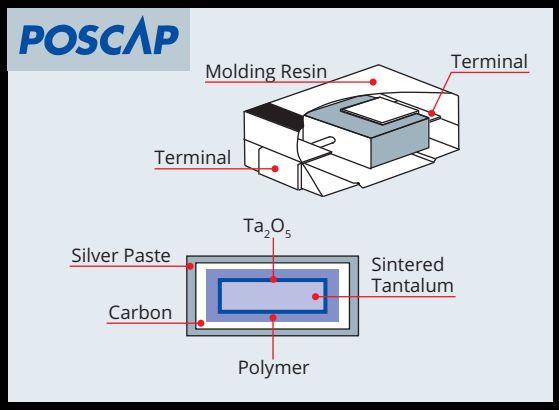
SP-Cap

- Aluminium-polymer
- Low profile
- High current capability

Voltage range	2V ~ 35V
Capacitance range	2.2uF ~ 560uF
Temperature range	-40°C ~ +125°C
ESR	down to 3mOhm
Ripple current	up to 10.2Arms
Lifetime	up to 1.000h at 125°C
Case size	7.3mm x 4.3mm
Height	0.9mm ~ 2mm

SP-Cap





POSCAP

- Tantalum-polymer
- Low profile
- High capacitance values

Voltage range	2V ~ 35V
Capacitance range	3,9uF ~ 1.500uF
Temperature range	-55°C ~ +125°C
ESR	down to 5mOhm
Ripple current	up to 6.1Arms
Lifetime	up zu 1.000h at 125°C
Case size	2mm x 1.25mm ~
	7.3mm x 4.3mm
Height	0.9mm ~ 3.8mm

For the lifetime of polymer capacitors, the following rule of thumb applies: For every 20°C reduction in temperature, the lifetime increases ten times. This applies at maximum loading by the rated ripple current.

Tell us what you need – we offer you the fitting product.

P05

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150°C SMD electrolytic capacitor

SUNCON
SUN Electronic Industries Corp.

SUN is pleased to present an SMD electrolytic capacitor which is especially designed for ambient temperatures of up to 150°C. In this context, too, the new CE-JX series can be loaded with the full specified ripple current, and provides a guaranteed lifetime of 1,000 hours under these conditions.

And even if you don't encounter such high temperatures of up to 150°C in your particular application, the CE-JX in any event offers you the advantage of increased lifetime at lower temperatures. For example, at 105°C, a lifetime of more than 22,000 hours is guaranteed, under full ripple current capability, or more than 5,000 hours at 125°C. And all this with a case size of 10x10.5mm.

Data in detail:

VOLTAGE (V)	CAPACITANCE (UF)	DIMENSIONS (mm)	ESR (OHM MAX @20°C/100kHz	RIPPLE CURRENT (mA@150°C/ 100kHz)
25	220	10x10.5	0.20	150
25	330	12.5x13.5	0.15	650
25	470	12.5x13.5	0.15	700
35	100	10x10.5	0.20	120
35	150	10x10.5	0.20	120
35	220	12.5x13.5	0.15	550
35	330	12.5x13.5	0.15	650

P06

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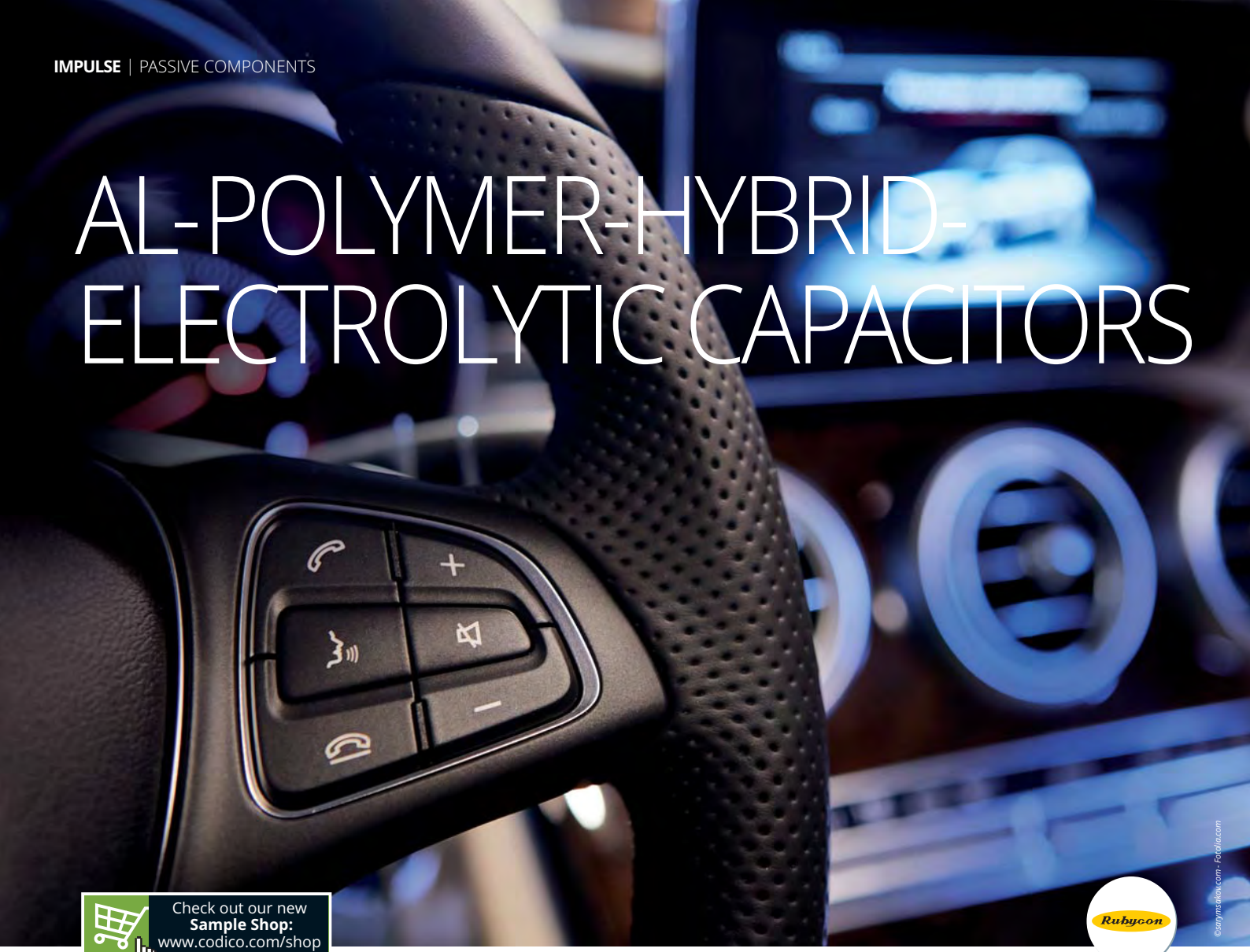
AL-POLYMER-HYBRID-ELECTROLYTIC CAPACITORS



If ESR and ripple current are the crucial parameters in your application, then hybrid capacitors could be the perfect solution for you.

Thanks to their outstandingly good electrical characteristics, these are used in situations in which space is limited or where, despite high currents, a compact solution needs to be found. A typical application is, for example, smoothing capacitors in DC/DC converters.

The much lower ESR and the significantly higher ripple current capability in the same case size, or even smaller, compared with conventional low-ESR capacitors, enables you to save space and costs. A reduction in the components required is also possible.

- Use of a smaller SMD case size instead of a large THT or SMD capacitor
- Use of only one hybrid capacitor instead of two or more electrolytic capacitors

The leakage current of these hybrid capacitors is in the range of that of electrolytic capacitors, and therefore appreciably below that of pure polymer capacitors. RUBYCON has now extended its product range of aluminium-polymer hybrid capacitors by small case sizes. The PEV series offers a temperature range of up to 105°C (10,000 hours guaranteed lifetime), PFV up to 125°C (4,000 hours guaranteed lifetime).

P07

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Now available in small case sizes!

The table below shows an overview of the new design formats

VOLTAGE (V)	CAPACITANCE (uF)	DIMENSIONS (mm)	ESR (mOhm max @20°C/100kHz)	RIPPLE CURRENT PEV SERIES (mA@105°C/100kHz)	RIPPLE CURRENT PFV SERIES (mA@125°C/100kHz)
25	56	6.3x6.1	50	1300	900
25	100	6.3x8	30	2000	1400
35	47	6.3x6.1	60	1300	900
35	68	6.3x8	35	2000	1400
50	22	6.3x6.1	80	1100	750
50	33	6.3x8	40	1600	1100
63	10	6.3x6.1	120	1000	700
63	22	6.3x8	40	1500	900

HIGH CURRENT CAPABILITY THANKS HEAT DISSIPATION

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With the LUR series (85°C/5,000 hours guaranteed lifetime) and LHR (105°C/5,000 hours guaranteed lifetime), RUBYCON is pleased to present new screw-terminal electrolytic capacitors, which provide an appreciably higher ripple current capability in miniaturized dimensions.

This is achieved thanks to what is known as the »extended cathode structure«, which allows an excellent heat dissipation from inside the capacitor. In this situation, the cathode foil contacted at the aluminium case, and the heat can therefore be dissipated with best possible effect.

RUBYCON offers a wide selection of different screw-terminal electrolytic capacitors, which are optionally available for stud mounting. But, as usual with RUBYCON, this broad product portfolio is far from finished. In close co-operation between the clients < CODICO > RUBYCON additional customer-specific solutions can be achieved, tailored precisely to your requirements. The electrolytic capacitors are produced on automatic assembling machines which were developed and constructed by RUBYCON themselves.

As well as this, RUBYCON also has its own aluminium foil factory. This know-how is the key to the development and production of technically demanding and cost-optimized products. The table below provides a short overview of the 5,000 hour/85°C versions from the standard range.

P08

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SERIES	VOLTAGE (V)	CAPACITANCE (UF)	DIMENSIONS (mm)	RIPPLE CURRENT (A@85°C/120Hz)
LSU	450	6800	77x191	19.2
LSY	450	6800	77x146	19.2
LUR	450	6800	77x193	25.3
LSU	450	10000	90x221	27.9
LSY	450	10000	90x176	28.7
LUR	450	10000	90x193	36.4
LSU	400	18000	90x241	38.9
LSY	400	18000	90x211	37.5
LUR	400	18000	90x220	45.1
LSU	500	4700	77x151	14.8
LSY	500	4700	77x136	14.2
LUR	500	4700	77x153	19

A POWERFUL FAMILY

The SM relay series from SANYOU is not just a single product but a big family out of different variants offering a wide variety for professional switching solutions in the 16A segment of power relays.

The SM relay series from SANYOU is not just a single product but a big family out of different variants offering a wide range for professional switching solutions in the 16A segment of power relays. Typical applications for this product are found in home automation and building management such as light controls, heating controls, fan controls, energy management, pump controls, door and gate controls to mention some. The other big segment is the area of household appliances like washing machines, dish washers, dryers, cooking plates but also smaller equipment such as coffee machines.

The 3rd segment the SM relay family addresses is industrial. Here the relays find their way into all kinds of interfaces, machine controls, and motor and motion controls.

The SM series is produced in Donguang, the headquarter of SANYOU, on a complete new line that is fully automated to secure highest quality levels and independency of human influence.

Highlights of this line are:

- Auto loading of material
- Auto assembling for the different components of the relay
- Sealed auto-cleaning modules (particles blowing and sucking)
- Auto-testing

Another very important quality feature of the SM relay is the design of the product itself. It is done in a way that no adjustment is required. This


Test Unit


Particle & Dust Cleaning Unit

Features

Technical details of the SM family:

- 1 and 2 pole version
- NO and CO version
- 16A high switching capacity for one pole, 8A for 2 pole
- 3.5mm and 5mm pinning
- AgNi and AgSnO contact material available
- DC coil from 5 to 110 Volts with low power consumption of 400mW only
- Class F coil system as standard
- Compact dimensions of 29.0 x 12.7 x 15.7mm (L/W/H)
- Reinforced insulation: >10mm creepage and clearance safety distances with 5kV dielectric strength between coil and contacts
- Plastics fulfill the requirements of glow wire IEC 60335-1 at product
- Ambient temperature -45°C to 85°C
- Flux proof and wash tight version available
- compliant with IEC/EN 60079-15 explosion-proof when sealed
- VDE and UL listed

2 special versions:

- SM-P version with a max switching power of 5.440VA for ambient temperature up to 105°C
- SMF version with vertical and horizontal quick connect terminal output with 16A switching performance for ambient temperatures up to 105°C in 1NO or 1NC version

design feature secures a very homogeneous electrical performance as all parameters influencing this result are kept within a tight tolerances.

The SM series provides a lot of different loads that have been listed at UL and VDE to proof the ability to switch not only resistive loads but also motors (HP ratings), solenoids & contactors (pilot duty ratings).

Examples for the 16A one pole NO version:

- **A300:** 720VA, 240VAC pilot duty at 85°C for 30.000 operations
- **1HP:** 240VAC (8 FLA) motor at 85°C for 30.000 operations

P09

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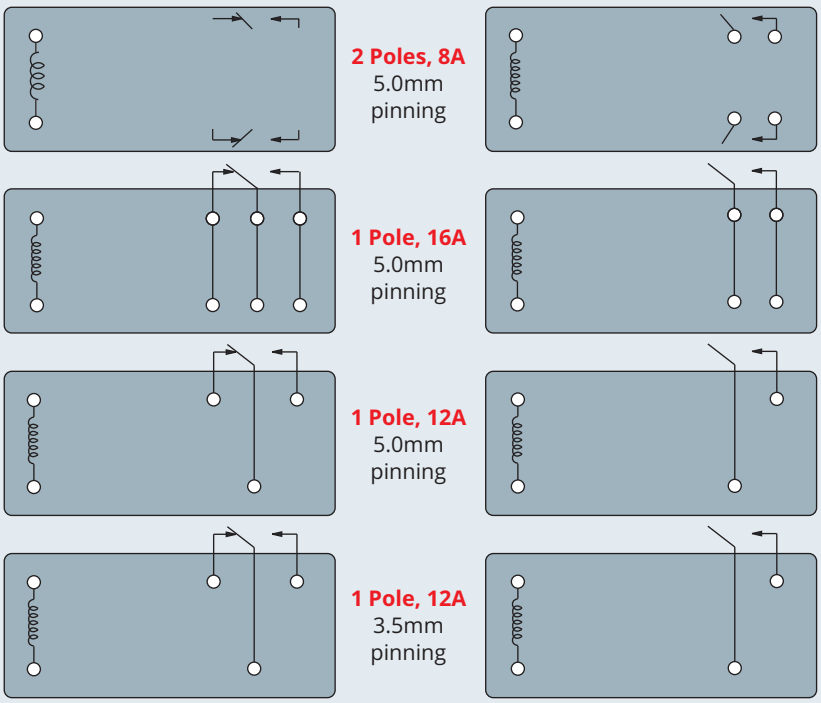
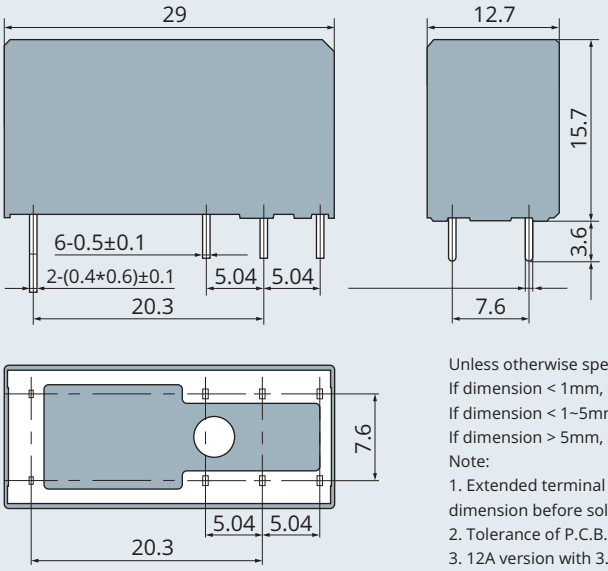
Dimensions and Pin-Layout

Wiring Diagram (bottom view)

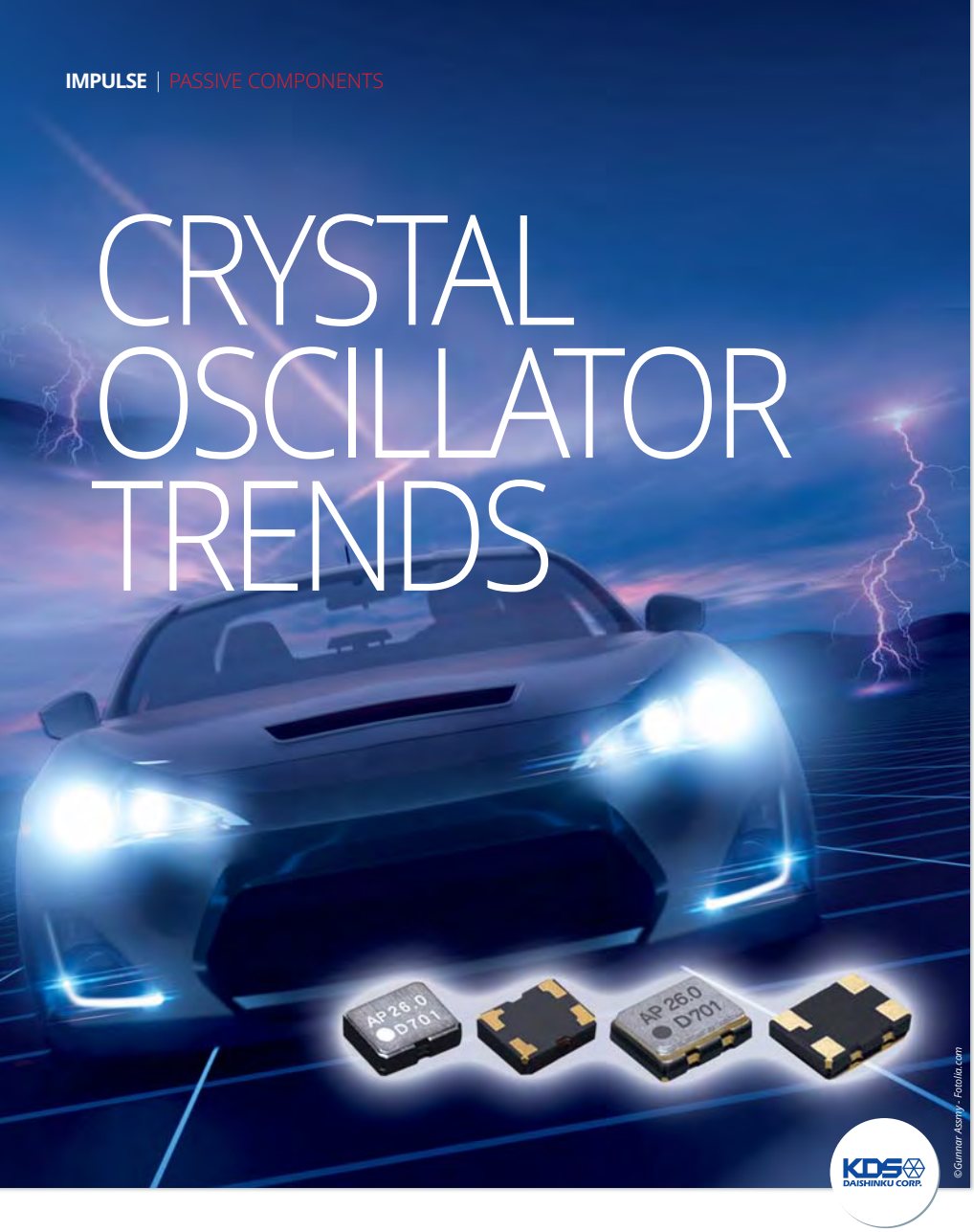


Dimensions



Unless otherwise specified:
If dimension < 1mm, tolerance: ±0.2mm
If dimension < 1~5mm, tolerance: ±0.3mm
If dimension > 5mm, tolerance: ±0.4mm
Note:
1. Extended terminal dimension is dimension before soldering
2. Tolerance of P.C.B. layout: ±0.1mm
3. 12A version with 3.50mm pin-distance optional

CRYSTAL OSCILLATOR TRENDS

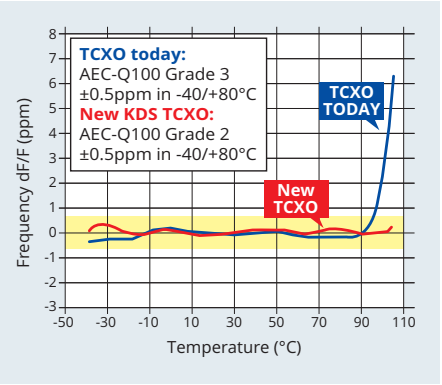


New KDS VC-TCXO type (DSA series) and TCXO type (DSB series) are capable of operating over a wide temperature range (-40 to +105°C) and high-precision (±0,5×10^{-6}) TCXO for Automotive/Industrial.

»What does the market request to crystal oscillator development?« This is the main topic which crystal engineers face. The most important point is »Package size«. Market request today is to reduce the size of circuit area, so many crystal manufacturers are competing for the smallest package size development. The package size trend of TCXO today became 2.0×1.6mm and 2.5 ×2.0mm, compared to 10 years ago 5.0×3.2mm was the most used package.

What comes next? Second point should be »High-precision over a wide operating temperature range«. 10 years ago, the precision request was ±2.0~2.5×10^{-6} stability in operating temperature range of -30 to +85°C. Then, the technology reached a tolerance of ±0,5×10^{-6} within -40 to +85°C, which is a request for today's automotive GPS application. But new requests coming from the market require the same tight tolerance, but for the wider temperature range.

For a long time the engineers had problems to manage the tolerance for temperature above 85°C. (See picture) KDS has developed new TCXO/VC-TCXO series DSA/DSB211SP (2.0× 1.6mm) and DSA/DSB221SP (2.5×2.0mm) which operate at the temperature range from -40°C to +105°C with tolerance of ±0.5×10^{-6}.



Even increasing operating temperature range up to 105°C, this did not have negative influence on the other electronic characteristics. Phase noise for example remained at the same level as at high precision TCXO which operates from -40 to +85°C. Moreover, new TCXO/VC-TCXO series meet AEC-Q100 standard, which is suitable for high temperature automotive application like GPS roof antenna, telematics or dashboard applications.

Another advantage which KDS can offer is the package itself. To make it down-sizing, most of the crystal manufacturers selected »Double-room« structure (called »H-type«), which divides the room of crystal blank and temperature compensation IC. With this structure, it is easy to develop smaller size crystal oscillator, but it is not well protected against humidity since IC room is only covered by resin molding. KDS develops and produces all their oscillators as a »Single room« structure type, where crystal blank and IC are in one room. Having this structure type, the component is hermetically sealed and able to resist humidity and all the other environmental influences.

P10

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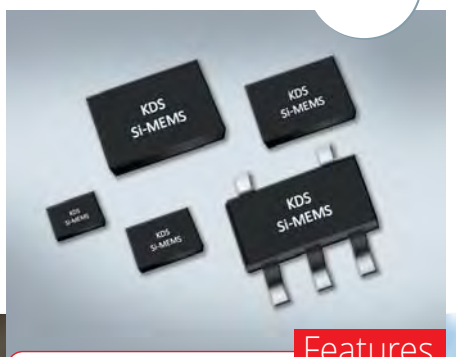
Features

- Temperature characteristic ±0.5×10^{-6} in -40 to 105°C
- MSL-1, most resistible against humidity in the market
- AEC-Q100 compliant
- Frequency available as below
  From 12.288MHz to 52MHz for 2.0×1.6mm size
  From 9.6MHZ to 52MHz for 2.5×2.0mm size
- Supply voltage available on +1.8V/+2.8V/+3.0V/+3.3V
- Same low phase noise as standard
  TCXO Ex) Frequency >26MHz
  Offset 100Hz: −105dBc/Hz
  Offset 1kHz: −125dBc/Hz
  Offset 10kHz: −135dBc/Hz
  Offset 100kHz: −145dBc/Hz

NEW CLOCK TO YOUR FUTURE

As a horse was replaced by gasoline car, as tubes was replaced by transistors, today's timing solution might be replaced by future solution for timing device market.



Features

MO1532 (1.5×0.8mm) and MO1533 (2.0×1.2mm)

- Available 1508 size (CSP), 2012 size (QFN)
- Frequency tolerance ±10×10^{-6}
- Frequency characteristic ±100×10^{-6} in -40 to 85°C
- Aging ±3.0×10^{-6} in 10 years
- Supply voltage 1.2 - 3.63V
- Current consumption 0.9µA

2016 will be the transformational year for timing device market. On November 2015, KDS and SiTime Corporation announced their strategic partnership agreement for MEMS oscillator. SiTime is the leading company for MEMS oscillator and KDS is the 3rd biggest manufacturer and seller of crystal products. The partnership of those two industry leaders will bring up another solutions for the timing device market.

You might have already heard about MEMS oscillator during the last 5 years, but it was not stable enough as crystal based timing devices. For 32.768kHz in the past, MEMS oscillators were able to achieve a accuracy of only ±500×10^{-6} within the temperature range of -40 to 85°C, where at a standard 32.768kHz crystal resonator was giving a tolerance of ±150×10^{-6} in same temperature range.

But nowadays, MEMS oscillators reach nearly same or even better specification than crystal oscillators. From the stability point of view, MEMS can already achieve a tolerance of ±100ppm from -40°C to 85°C range, and there are more stable products in the pipeline. Also current consumption had shown significant improvement and already reached around 1.0µA, while MHz XOs are in the range of mA. MEMS oscillators have become indispensable components for large number of applications.

Besides already mentioned characteristics, what are the other strength of MEMS oscillators? One of the advantages is definitely the small package size. The smallest MEMS oscillator today is 1.5×0.8mm while the smallest crystal oscillator has finally reached 1.6×1.0mm size. MEMS resonator inside the oscillator is 0.42×0.42mm size, which is smaller than the CMOS-ASIC inside. The main matter to become smaller for MEMS oscillator is only the ASIC size. But, to reduce the size of a XO, both crystal blank and ASIC need to be scaled down, and this makes it more difficult to fulfil the market requirements.

Numerous applications already use MEMS oscillator as clock reference. This means, the MEMS oscillators have gained confidence and trust in the market. It will be one solution for your product to use KDS MEMS device for futurity.

We will be very happy if you ask us more detail information.

P11

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TAILORED POWER

Power Comparison of Topologies

Diagram

AC/DC and DC/DC converters for industrial and automotive applications are electrical circuits, which converts AC to DC and DC voltage to a lower or higher level.

For isolated converters a variety of topologies is available, but only three of them can be considered for the demanding requirements of the modern markets in case of optimizing efficiency and reducing the costs in view of profitability. Flyback, Forward and Push-Pull Topology – all these isolated converters are equipped with transformers. The power transmission from input to output is carried out through a suitable transformer. Which type of topology is used depends on the power class of the application. Therefore, the focus is always on customer applications. The diagram clearly illustrates the power range of the respective topologies. In nearly all cases the power transformers are custom-designed solutions and need to be planned very carefully, as there are a lot of characteristics which have a relevant impact on the transformers performance. To meet all required technical specifications and quality demands, following attributes have to be taken into design consideration:

- Topology (Flyback, Forward, ...)
- Input Voltage Range
- Output Voltage
- Output Power
- Output current Range
- Switching Frequency
- Temperature Rise
- Mechanical Dimension
- Safety and Insulation System Requirements (e.g. UL, IEC, ...)

Switching power transformers offered by our suppliers ELYTONE and SUMIDA have been optimized to provide maximum power conversion efficiency in the different circuit configurations like Flyback, Forward, Push-pull etc. Working closely with our suppliers and customers, our design-in service will not only provide the optimal and perfect technical solution based on the latest technology trends but also ensure that the power transformer meet all required safety aspects and standards. In addition to our support through project and design development, we pay attention on process and price optimization.

P12

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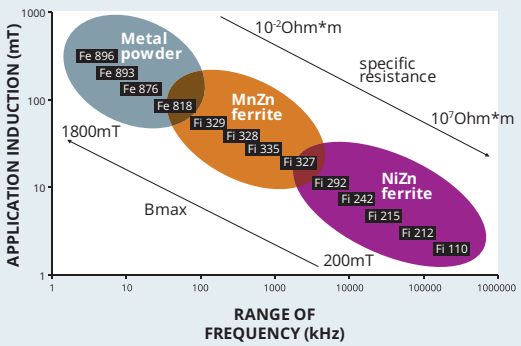
Power Comparison of E-Cores

CORE TYPE	POWER RANGE (W)							
	<5	5~10	10~20	20~50	50~100	100~200	200~500	500~1K
EI	EI12.5	EI16	EI19	EI25	EI40		EI50	EI60
EE	EE13	EE16	EE19	EE25	EE40	EE42	EE55	EE65
EF	EF12.6	EF16	EF20	EF25	EF30	EF32		
EFD		EFD12	EFD15	EFD20	EFD25	EFD30		
EPC		EPC13	EPC17	EPC19	EPC25	EPC30		
EER	EER9.5	EER11	EER14.5	EER28	EER35	EER42	EER49	
ETD				ETD29	ETD34	ETD44	ETD49	ETD54
EPC	EP10	EP13	EP17	EP20				
RM	RM4	RM5	RM6	RM10	RM12	RM14		
POT	POT1107	POT1408	POT1811	POT2213	POT3019	POT3622	POT4229	
PQ				PQ2016	PQ2625	PQ3230	PQ3535	PQ4040
EC						EC35	EC41	EC70

Ferrocarit Summary



NEW SUGAR CUBE

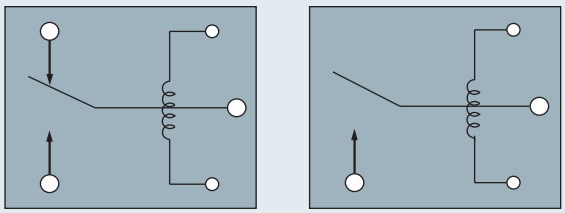
SANYOU has extended their product range of Sugar Cube relays with the »L« variant of the SRD/SRDI relay series. To achieve a better electrical performance design changes have been applied, now hitting ratings up to 20 Amperes and a maximum switching power of 5.540VA as well as a better electrical life performance at high ambient temperatures.

For the use in stove controls the relay offers a 10A VDE rating of 100.000 operations at 105°C on the NO contact. Besides VDE the new relay is also UL and CQC approved, including a TV8 rating for inrush currents up to 163A. With a height of only 15,6mm it fits perfectly into applications with limited space. A version with 6kV impulse withstand voltage between coil and ontacts is available as well.

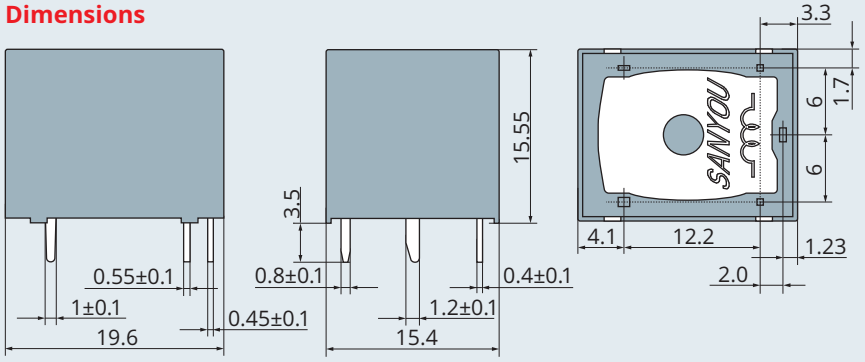
The relay meets the requirements of IEC 60335-1 and is additionally compliant with IEC/EN 60079-15 explosion-proof when sealed. Production is done on fully automated production lines.

Miniature Power Relay SRD-L/SRDI-L

Wiring Diagram (bottom view)



Dimensions



Unless otherwise specified:
If dimension < 1mm, tolerance: ±0.2mm
If dimension < 1~5mm, tolerance: ±0.3mm
If dimension > 5mm, tolerance: ±0.4mm

Note:
1. Extended terminal dimension is dimension before soldering
2. Tolerance of P.C.B. layout: ±0.1mm

Typical applications are found in:

- Heating elements
- Building management
- Door & gate controls
- Light controls
- Household appliances

P13

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IT'S A KIND OF MAGIC

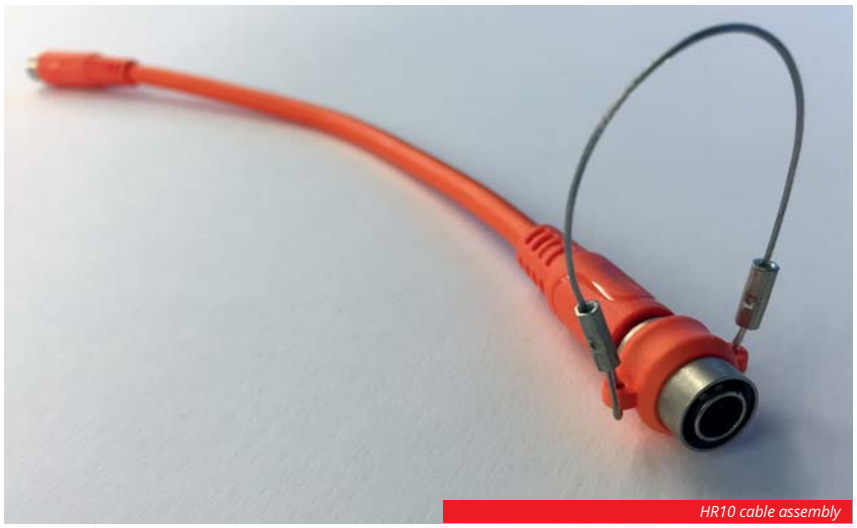
CODICO does more than »just« provide cable assemblies! Cable assemblies from CODICO are always tailor-made solutions. This allows us to fulfil almost every individual product requirement.

Together with our cable assembly partners, we can offer professional advice, extensive knowledge, and long years of experience in the cable assembly sector. One of our focus partners for cable assemblies is the company SINBON. It's a kind of MAGIC!

EV Charger

Automotive

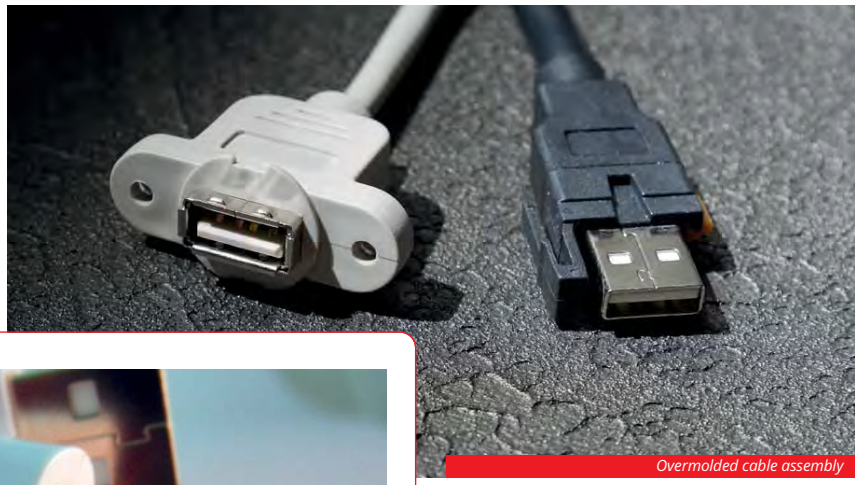
SINBON has acquired the international authentication of TS16949. Their products include car charger, O2 Sensor Cable, USB cable, AUX cable, High frequency transmission cable and so forth; among which, the O2 Sensor Cable was especially recognized by some prominent international automobile electronics providers.



HR10 cable assembly

Medical Health

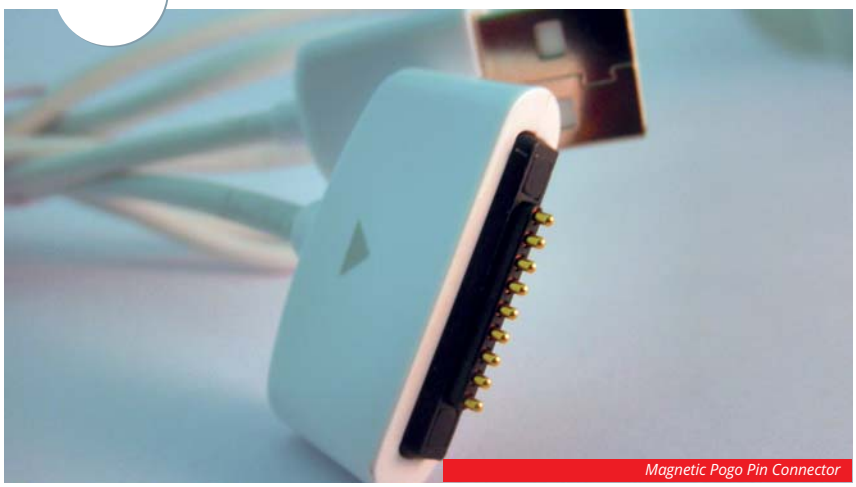
SINBON offers both low-mix, high volume as well as high-mix, low- volume box-build solutions, and develop a broad range of module and finished products assembly from large diagnostic imaging equipment, medical laser equipment to small patient monitoring device.



Overmolded cable assembly

Industrial Application

SINBON provides rugged cable assembly services. Their products, with environmentally durable technology such as waterproof, UV resistant, oil resistant, and flame-retardant, have optimum performance even under harsh environmental conditions.



Magnetic Pogo Pin Connector

Communication

SINBON offers many different kinds of GPS antennas and RF cable assemblies. This includes assemblies with U.FL from Hirose which is undoubtedly the best-known and most popular series for SMT micro-coax connectors. Beside of that SINBON can realize individual customer specific solutions with pogo pins and magnetic locking feature.

Micro-coaxial Connections & Antennas

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AC Cable for Solar Micro-Inverter

Green Energy

SINBON produces environmentally friendly lighting that can save up to 70% energy efficiency and develop alternative energy components and systems to take the lead in reducing industrial impact on the planet. From solar system, wind power to LED lighting, their product portfolio creates a new »All-win« mechanism, which benefits our customers, our environment and our future.

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S01

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STRONG: DF63 SERIES

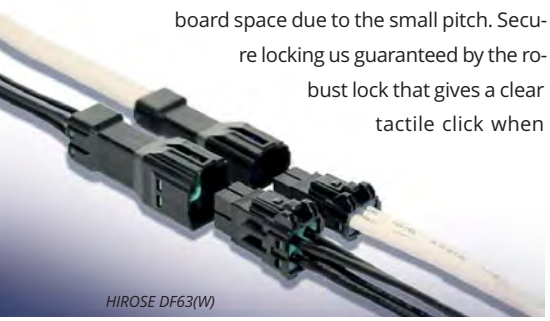
HIROSE Electric has introduced the DF63 series to meet the increased requirement for small, high powered wire-to-board connectors offering advanced reliability for industrial equipment.

Features

- Contact positions: 1-6 (most sizes)
- Pitch: 3.96mm
- Current rating: 15A
- Voltage rating: AC/DC 630V
- Mating cycles: 30 (minimum)
- Cable size: AWG#16 to AWG#18
- Versions: straight, right angle, in-line, waterproof in-line (DF63W)

The main connector range consist of cable mount, female crimp sockets and board mount, vertical and right angle male headers that handle up to 15A (amps) maximum current rating. Waterproof and non-waterproof in-line versions have been added to the range (DF63W = waterproof type).

The overall size has been designed with space saving in mind. The three position header for example, only occupies 88mm² approximate board space due to the small pitch. Secure locking us guaranteed by the robust lock that gives a clear tactile click when mated. This confirms the connector is fully engaged guaranteeing complete electrical and mechanical connection. The lock is on the centre if the housing to avoid uneven locking and cable entanglement which is common with side locks. Furthermore, multiple connectors can be mounted closer together side-by-side.



HIROSE DF63(W)

The header features square male pin contacts that have a wide conductive surface area (1.14mm each side) to carry the high current. Each contact is protected by housing walls to prevent them from short circuits and being touched. The cable mount female socket housing utilises crimp contacts that have a unique internal multi-point contact structure to ensure good contact wipe and high contact reliability. The design of the housing base is tapered to allow resin sealing up to 5mm high. The resin stopper which is a step underneath the lock, stops the resin rising too far. Keying variations are available to prevent incorrect insertion when multiple connectors are used.

The DF63 series is part of the EnerBee product family. The Enerbee family features wire-to-board and wire-to-wire power connectors to provide technically advanced connectivity solutions for industrial power sources.

Ideal applications are robots, medical devices, industrial machinery, smart meters, gaming equipment and home appliances.

For more information please contact

S02

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OPTIMIZED FOR AUTOMOTIVE REQUIREMENTS

Features

- Number of contacts: 4-60 (most sizes)
- Pitch: 0.5mm
- Current rating: 0.5A
- Voltage rating: AC/DC 50V
- Meets automotive requirements
- Halogen Free

HIROSE has introduced the FH52 series to meet the requirements for highly reliable and robust flat flexible cable/flat printed circuit (FPC/FFC) connectors.

The connector housing incorporates an innovative, robust locking structure to ensure that the actuator cannot be removed even under rough operation.

The FH52 series can withstand higher operating temperatures than standard FPC/FFC connectors, particularly FH52K series that has an extended temperature range up to 125°C. Due to this extraordinary heat resistance the connector satisfies the needs of severe automotive requirements.

FH52K series is designed with L-shaped metal fittings to allow visual inspection of the soldering process from the top. In addition, an enhanced PCB retention force of approximately 90N can be achieved, compared to the space saving I-shape with 50N retention force.

The insertion of the FPC/FFC into the connector is user-friendly due to the wide 110° opening range of the rotating actuator. Special cavities on each side of the connector, known as »side catchers« are provided to hold a tabbed FPC/FFC in place. A firm and clear tactile click confirms that correct locking of the FPC/FFC has been completed enabling a stable and reliable connection.

For application with extreme vibrations and shocks the FH52T series offers a 2-point contact structure which features two spring loaded independent contacts. Below you will find an overview of the available versions.

Ideal applications are car infotainment, satellite navigation, multifunctional office equipment, LCD/Digital TV, DVD players and many other devices needing a robust connectivity solution.

S03

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	FH52	FH52E	FH52K	FH52T
Operating Temp.	-40°C to +105°C	-40°C to +105°C	-40°C to +125°C	-40°C to +105°C
Contact Design	1-point	1-point	1-point	2-point
Metal Fittings	I-shape	L-shape	L-shape	L-shape
PCB-Layout	For I-shape	For L-Shape (FH52E, FH52K and FH52T have same PCB pattern)		
FPC/FFC-Layout	Common for all versions			

FOR ULTRA-SMALL CONNECTIONS

HIROSE has introduced the DF59/DF59M/S/SN series to meet the requirements for compact wire-to-board and board-to-board connectors with advanced reliability for lighting applications and where ultra-small connections are required.

The **DF59** is a multifunctional connector applicable for wire-to-board power supply connection, a board-to-board coplanar connection with the option of a shortening plug. The pitch is 2.0mm and 4.0mm, dependent on the application and the related requirement such as higher clearance and creepage distances for power supply applications. The connection system can be applied with 3A by using the defined cable gauge with AWG22. The voltage is specified with 230V or 350V dependent on the pin size used. The DF59 connector utilizes the HIROSE »swing« lock which is a user friendly, innovative locking mechanism allowing increased cable retention forces.

The **DF59M** is an ultra-slim wire-to-board single pole connector that consists of a crimp plug and receptacle. The DF59M receptacle has a different design to the DF59S/SN receptacle; however the PCB layout has a double footprint so that both receptacles can be mounted on the same PCB pattern. The crimp plug features an enhanced 3-point contact structure with a spring feature to ensure high contact reliability. The positive lock feature provides 16N of lock retention force to ensure a secure connection that is confirmed by an audible tactile click to ensure correct engagement. A higher current rating of up to 6A can be applied to the DF59M.

The **DF59S/SN** is an ultra-slim board-to-board single pole connector that consists of a joining plug and a board mounted receptacle. A slim profile plug (DF59S) or an ultra-slim profile plug (DF59SN) is available. The low mated height profile is only 1.18mm (DF59S) and 1.2mm (DF59SN). The receptacle is common for both plug types and features a friction lock that provides an audible click when mated.

An additional feature of board-to-board version is a unique 3-Axis floating structure. This permits movement of ±0.5mm in X and Y directions, and ±0.2mm in Z direction to compensate for any tolerances during the mating process. Special innovative, robust, stress free contacts protects the contact area from any mechanical stress during the floating process.

Suitable applications are LED lighting, handheld devices, sensors, battery connections, small DC motor drives, and other devices.

S04

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	DF59 Wire-to-Board & Board-to-Board Multifunctional connector	**DF59S** Board-to-Board slim line plug	**DF59SN** Board-to-Board ultra-slim line plug	**DF59M** Wire-to-Board version
				
Contact Positions	1-4	1	1	1
Current Rating (Amps)	3A	3A	3A	6A*
Voltage Rating	230V / 350V	230V / 350V	230V / 350V	350V
Mating Cycles	30 / 10	10	10	20
Temperature Rating	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C
Halogen Free	No	Yes	Yes	Yes
Cable Size AWG	22	N/A	N/A	22-28

**Dependent on AWG size*

EXPERT FOR STORAGE BATTERIES

Features

- Number of contacts:
  Power: 2 / Signal: 18 position
  (divided into 8 + 10 position)
- Current rating:
  Power: 100A / Signal: 1A
- Voltage rating:
  Power: AC/DC 1000V /
  Signal AC/DC 250V
- Structure: Floating
- Cable size: 22mm² (Max)
- Mating cycles:
  Power: 100 / Signal: 30
- Certification: UL, C-UL*,
  TÜV approval pending

**Except signal lines (Conditions for safety standards vary depending on submitted applications of current and voltages ratings).*

HIROSE has introduced the PS3F series to provide a hybrid high-power and signal connectivity solution for storage battery applications where rear maintenance space is limited.

The PS3F consists of a low profile, system rack connector that can be easily assembled on to the system rack from the front. The corresponding mating half battery module connector is easily assembled on to the battery module with M6 screws. This combination facilitates easy plug-in and pull-out maintenance.

In addition, the system rack connector body has a floating structure. Each side of the connector body has a hole that can accept a floating screw. The clearance between the floating screw and connector flange absorbs panel mounting misalignment of ±2.5mm in X and Y directions to allow easy plug-in.

The system rack connector uses blade contacts to deliver the 100A high current rating. For the 1A signal current, the PS3F utilises the highly reliable GT8E crimp contact connectors. The GT8E connectors feature a robust structure and meets automotive specifications. Many variations exist to include wire-to-board and in-line connections. The GT8E connectors can be daisy-chained for design flexibility.

The battery module connector, in addition to the GT8E connectors, incorporates a unique clipping contact design with a bellows type contact to deliver the high-power. This allows multiple contact points to reliably engage with the mating blade contact suppress contact resistance and support high current flow. Safety is assured with the finger protection design that complies to IP2X evaluated by IEC 60950 test finger to ensure the contacts can't be touched.

Ideal applications are UPS and storage battery applications where user-friendly, maintenance efficiency is needed.

S05

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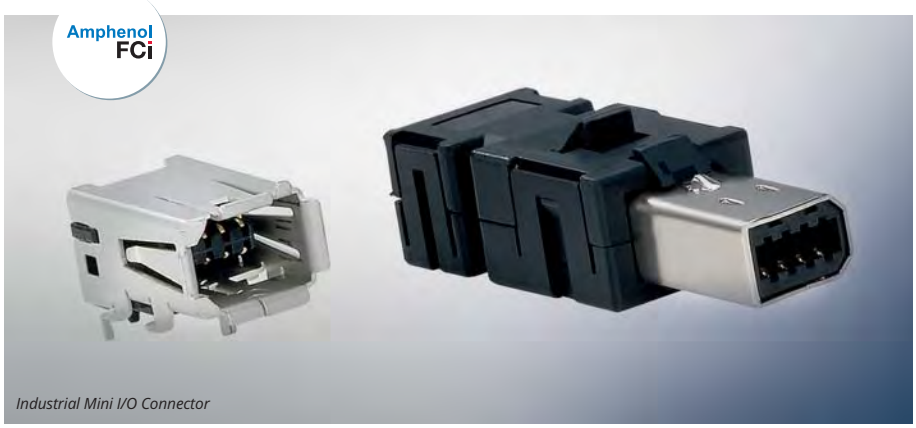
SECOND-SOURCE-AGREEMENT

for Industrial Mini-IO Connectors

AMPHENOL FCI, leading supplier of connectors and interconnect systems, announced an agreement with TE Connectivity* (TE), for Industrial Mini Input/Output (I/O) connector families, to establish the Industrial Mini I/O family in the market as the reliable Ethernet connector.

First introduced in 2012, TE's Industrial Mini I/O solution is gaining more and more traction. The Industrial Mini I/O connector is only one quarter the size of the conventional RJ45 plug, and provides space saving and the flexibility to use limited space on the PCB more effectively. Designed with two points of contact, this connector is built for the stringent demands of an industrial and high vibration environment, enabling increased productivity through a more reliable connection.

Industrial Mini I/O is a compact wire-to-board interface which is field installable in virtually any environment. The Mini I/O unique locking system is specified to 100N of pull force. With its innovative piercing termination, the Mini I/O Field Installable version decreases the time usually needed to terminate the wires through soldering and with an easy to use hand tool, the field assembly in virtually any environment is now possible.



Industrial Mini I/O Connector

Features

- Operating temperature: -40°C to +85°C
- Rated Voltage: 30V
- Current Rating: 0.5A
- Tray packing

Main features:

- One quarter the size of a conventional RJ45
- Versatile solution supporting a wide variety of applications
- Highly reliable connection with 2 points of contact per line
- Unique locking feature with high cable retention force
- Up to 1500 mating cycles
- Two unique interfaces to prevent mismating
- High temperature thermoplastic housing

S06

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AMPHENOL FCI announced an expansion of their power connector family which now includes the PwrMAX® Ortho power connectors.

PwrMAX® Ortho

PwrMAX® Ortho power connectors are designed to support a new datacenter equipment trend known as orthogonal system packaging architectures. This architecture can offer improved data transfer and improved system cooling by eliminating mid-plane circuit boards.

PwrMAX® Ortho power connectors can be used with either busbars or circuit boards to distribute power in systems with orthogonal architectures. The connectors also feature AFCI's revolutionary new GCS™ plating, and supports current loads of up to 100 amps per contact. The connector is extremely energy efficient, with a maximum contact resistance of just 0.3mOhms, and is rated to operate at up to 125°C.

Outstanding highlights are:

- Press-fit termination to support both PCB and busbar applications
- 100A per contact
- GCS™ plating technology provides very low resistance and low voltage drop
- Supports ±3.5mm gatherability for blind mating
- PCB footprint allows easy PCB trace routing
- Supports airflow passage around and through the connector, eliminating midplane and backplane air blockage
- Wide Operating temperature from -40°C to +125°C

With the unique and robust contact design, the blind-mate-able connector provides a highly reliable low resistance interconnect path for modern orthogonal systems architectures.

The PwrMAX® Ortho power connectors provides a compact means for connecting up to 100A DC power in a pcb edge-to-pcb edge application.

S07

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SPEED FOR INDUSTRIES

YAMAICHI continues to work on building out its M12 product series Y-Circ® M and the push-pull circular connector series Y-Circ®P.

M12 with X coding and in protection class IP68

Based on the familiar modular system of the Y-Circ® M, in which 360° shielding and vibration protection can be added by modular configuration, YAMAICHI Electronics has now completed a CAT6A version. This X-coded, IEC 61076-2-109-compliant connector permits the interference-free transmission of signals up to 10Gbit/sec. That highlights the competence of YAMAICHI Electronics when it comes to the design and production of high-speed connectors.

Push-pull with high-speed insulators

Special insulating inserts were developed for high-speed data transmission. To ensure conformity with CAT6A, the pin layout in the insulator was fully redesigned. This particular layout is available in the diameters of 12 and 15mm. So far, this is unique on the market. Even at the smaller size 12, 10Gbit/sec can be achieved. The customer can select the specific connector size in accordance with their requirements.

Industrial strength

The M12 in CAT6A is also IP68 protected and meets the strictest quality standards for secure contact. The same is true of the CAT6A push-pull in IP50. This is particularly vital for demanding applications in industrial environments.

Production in Germany

To permit fast, flexible production, these high-speed versions in both series are also produced by YAMAICHI Electronics in Germany. This location has been active for years in the area of cable configuration and the production of connectors.

S08

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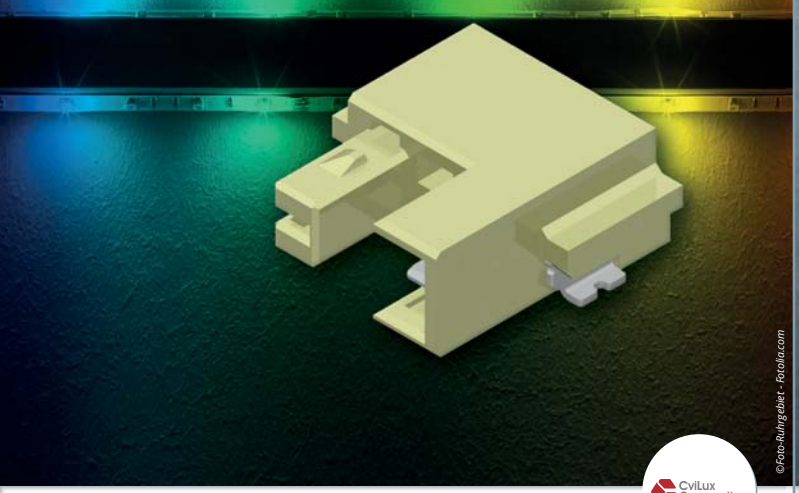
Single-piece plug-in system



With the CIL1 Series, CVILUX can now meet the demands and requirements of the market when it comes to connecting two co-planar PCBs. The key feature of this series is that it involves a hermaphrodite connection system, which combines plug and socket in one component. The connectors are produced in SMT format, with pitches of 3.50mm, and are available in 2-pole design.

Features

- Simplifies the production process, reduces costs
- Plugging procedure possible in horizontal and vertical direction
- Positioning pins for secure retention on the board during the soldering process
- T&R packing for automatic assembly process
- Suitable for THR solder process
- Special LCP version available, in order to avoid discolouration due to the soldering process

S09

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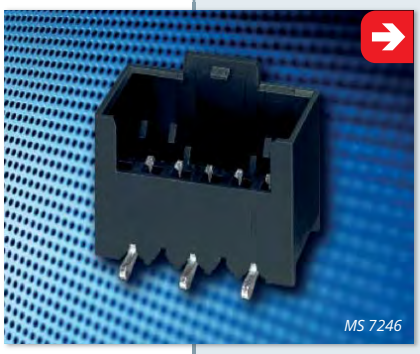
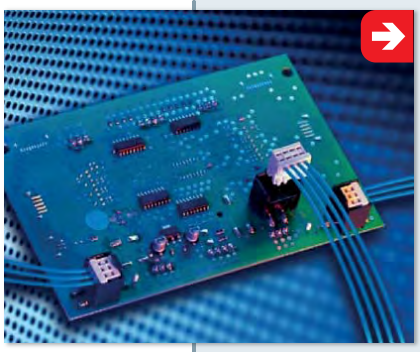
TECHNICAL DATA	
Soldering technology	SMT
Number of pins	2
Pitch	3.50mm
Height	3.00 mm
Temperature range	-25°C to +85°C
Rated current and voltage	3.0A 250VAC/DC
Packing	Tape & Reel

Good News from ECO-TRONIC



MS 7246

MS 7246



The use of ECO-TRONIC connectors has been tried and trusted in many different applications in the domestic appliance industry, as well as in automobile and industrial electronics. Now, to meet the market demands for functional and economical products, STOCKO has extended this series with these two new members.

ECO-TRONIC pin connector for SMT

As well as pin connectors for THT technology, STOCKO can now also offer users, when the need arises, series in SMT technology. For economical processing, the pin connectors are available in blister belt format or as Tape & Reel, as well as in standard packing.

Key features:

- RAST 2.5 Standard
- SMT technology
- For vertical plugging
- 3 to 10-pole
- MS 7246 with latch
- MS 7247 without latch
- Rated voltage 32V
- Rated current 2A
- Approvals in accordance with DIN EN 61984 and UL/ULC E96569

S10

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MULTIFUNCTIONAL: DINKLE BUS

You are still searching for a suitable housing for your electronic control systems and don't want to renounce on modern fieldbus technology? The DINKLE BUS system is a universal housing system for interface and system solutions, which sets new standards in flexibility and miniaturization.

Compact design and integration of the latest communication interfaces

The standard housing with thickness 12mm allows up to 16 poles with front connection technology. This solution is particularly suited where space is a critical factor. A wide range of connection technologies, for example USB, RJ45 and D-Sub, are compatible with IoT (»Internet of Things«) and Industry 4.0 applications.

Fast and simple wiring

In order to save time and costs, all cable connections of DINKLE Bus system are with push-in design even the bus connector itself.

Optical LED-displays on the terminal blocks

Appropriate terminal blocks are also available as pluggable solution and offer direct LED light pipes to indicate the operational status.

Safe connection of the power supply including reverse-pole protection

The patented bus connector make sure that modules are protected by a grounding contact while connecting to the bus plate to ensure signal interference-free and safety in power supply. It connects several electronic modules, which are mounted on the DIN rail.

Great choice and flexibility

The bus plate consists of up to 8 gold-plated terminals which can be installed on all common TS-35 DIN rails. There are standard lengths, as well as customized lengths up to 1.000mm available. Accessories like marking labels for clear designation of the LED indicators, expansion connectors for extending the bus plates, covers for DIN rails and end clamps complement the product range.

If you also want to use a separate serial bus for communication in addition to the parallel supply lines, then DINKLE has the perfect solution with its multifunctional Etherbussystem.

S11

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CODICO continues to grow: Acquisition of Broadband Technology AB


Broadband Technology AB in Sweden

CODICO continues its growth strategy by acquiring a 100% stake in Swedish firm Broadband Technology AB as of 11 November 2015. The objective behind the acquisition of the Swedish distribution company is to expand CODICO's presence in the Northern European market.

Stockholm-based Broadband Technology AB has been operating in the market for the last 15 years, and is considered a leading design-in company in the Nordics. The company's product range includes active components and modules, and new suppliers – predominantly from the wireless segment – will now be added to the CODICO line card, opening new potentials for synergies and further growth.

Broadband Technology will be integrated in CODICO GmbH as a fully-owned subsidiary, and for the time being the Broadband brand will be maintained. During the coming months, the head office of Broadband in Stockholm will be upgraded to an additional product competence centre next to those in Perchtoldsdorf (Austria) and Munich (Germany), so as to offer professional support to existing and potential customers in Northern Europe.

»The acquisition of Broadband will not only expand our product range, but also our know-how. We regard this expansion as a building block in our long-term growth strategy and as an essential element of internationalisation. CODICO and Broadband operate on the basis of a similar design sales approach, and they also share the same values and visions. For this reason, we believe we have found the perfect partner in Broadband for this merger«, explains Sven Krumpel, CEO of CODICO GmbH.

The main philosophy of Broadband – and of CODICO – is to support customers with profound expertise from the product idea to well beyond the order placement. *»Through the merger with CODICO, Broadband will give its customers access to new products, state-of-the-art logistics, profound technical expertise, and outstanding services«,* says Magnus Gustavsson, CEO Broadband Technology AB, explaining the reasons behind the partnership decision. Mr Gustavsson further says that Broadband's main focus are the needs and expectations of the customers – and he sees the acquisition by CODICO as a marriage of strengths and know-how.

In addition to the existing sales office in Denmark, Broadbands team of six staff members will further bolster CODICO's presence in the Nordics and provide support to customers in Sweden, Denmark, Norway, and Finland. This expansion step will secure new products and designs for CODICO in the Nordics, and delivers further proof of the company's long-term growth strategy.

D03

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New record year: CODICO at the embedded world 2016

The 2016 embedded world Exhibition & Conference was staged in Nuremberg from 23 to 25 February 2016 and managed to beat its own record once again: The fair was attended by 30,063 international expert visitors, a 17% increase over the previous year!

The 939 companies exhibiting there turned the 14th embedded world into an international hotspot for everything about embedded system technologies! This leading international fair once again defended its reputation as an established event in the world of embedded systems.

CODICO was also present at the embedded world in Nuremberg, showcasing a series of genuine product innovations. Its comprehensive portfolio ranged from WISECHIP's round graphics OLED, power converters, and new power supplies for medical technology to bluetooth & wireless LAN components and modules for IoT applications. Visitors to CODICO's booth were given the opportunity to exchange information with and obtain advice from product managers and technical sales people.

The booth also offered some distraction, fun and action with a hand-crafted game directly from Vienna's MuseumsQuartier: the forklift Derby was a combination of art, skill, and technique! The objective of the game was to navigate the remote-controlled forklift – including the pallet – from the starting point to a platform: a truly demanding challenge!

D04

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CODICO TEAM

Hello readers!

Christian Nix

I have been working as a sales engineer for CODICO's interconnect systems in Southern Germany, Switzerland, and France for four years. I do not consider myself only a salesman but, above all, a technical consultant. Although my roots lie in a mechanical education, I quickly realized that my professional passion is electrical engineering. So some twelve years ago I underwent further vocational training to become a state-certified electrical engineer.

Therefore, electromechanics, which is basically the essence of interconnect, was somehow tailor-made for me. CODICO offers the ideal conditions for unconventional minds like me to be creative and thus also successful.

The main reason why I appreciate my job at CODICO so much though, is that I can reconcile work and family so well here. Thanks to my home office in an idyllic small village at the foot of the Swabian Alps, I can be very close to my two wonderful daughters (3 and 5 years old) most of the time so I almost don't miss a single stage in their lives.

I organize my free time in many different ways. Since I have always been a hobby mechanic, I spend a lot of time in the evenings in my motorcycle workshop, surrounded by modern-era classics from the 70s and the 80s. During the warm months, I dedicate my weekends to slowly but steadily converting our huge garden into an adventure park, and I invest the winter months in our small house, now over 60 years old. In the little time I have left, I enjoy playing music on my guitar. During the last 20 years, I performed as a bass player with different rock bands. Though I currently do not have such a fixed »engagement«, my children are a very grateful audience.

D05

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Joachim Strohschenk

My name is Joachim Strohschenk and I have been working in sales and as product line manager for the »Active Components« department at CODICO Germany since July 2012. After working for several years with »major« distributors in the area of line management and FAE, I realized that I could put my experience and skills to better use with an innovative Design-In distributor.

I find the balance to my professional life at home with my family. I enjoy being outdoors, so you will often find me riding a bicycle, hiking, or travelling through a European country on a motorbike, and I have been visiting the Wacken Open Air festival for years! I can relax best listening to good music, ranging from classical music to heavy metal.

My sense of wellness also gets a boost from culinary pleasures, like a fine cheese or a nice piece of steak accompanied by a beer or a glass of wine. I generally consider myself a positive person who always keeps his cool; after all, there's always a suitable solution for every problem.

I would like to close with a quote from Dr. Hermann Simon, a German economics professor, book author, and columnist for the Manager magazine. »The more possibilities technology creates, the more important simplicity becomes«.

D06

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Ursula Neugebauer

I have been working part time in the accounting department of CODICO since November 2011, though I took a short nine-month trip to the accounting world of a shopping centre operator, only to gladly return to CODICO in September last year.

A few words on my career: After graduating from commercial college, I gathered professional experience at several tax consulting firms and large corporations. I also worked at the headquarters of a pharmaceutical group in Switzerland for 5 years. My duties at CODICO mainly include the daily booking of account statements, administrative activities such as the creation of master data on accounts receivable and accounts payable, or obtaining credit standing information, processing travel expense reports of my colleagues, and – typical in accounting – regular accounts maintenance, various reconciliation tasks, and statistical evaluations. I also issue statements of balances for our customers and suppliers or their tax consultants. Some of them are familiar with my name, perhaps from our reminder letters. Although this is an unpopular theme, I always see it as an opportunity to clarify uncertainties. I find some welcome diversion from my tasks when substituting colleagues, during which I book invoices in the accounts payable department, process reminders, and make payments.

I prefer spending my free time in nature: either with gardening, taking small walks, or making weekend trips to the surrounding provinces for hiking. Since I like crafting and I am fairly good with my hands, there is always some work to do around the house. Another way for me to find balance in life by having cosy gatherings with friends or family.

D07

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Jennifer Hejl

Dear Impulse readers, my name is Jennifer Hejl and I have been a proud member of the CODICO family since April 2012. I work at the inside sales of the CODICO Passive Components department. Together with my colleague, Germany Regional Sales Manager Dirk Voss, we provide customer support to key accounts Miele, SMA Solar, Viessmann, and Steinel. Initially, I was also responsible for the order administration of these four customers. Due to CODICO's constant growth, we decided to separate order entry from the inside sales. Therefore, an Inside Sales Team was created in 2013, made up of myself and other colleagues. As part of the restructuring process, I also took over the Southern Germany region (Postal Code 8 & parts of 7) and Switzerland in addition to the four key accounts. What I especially enjoy is that no day is like the other. There are always new challenges to manage, which may seem unsolvable at first glance but nonetheless offer new opportunities for personal improvement. Thanks to the excellent cooperation within the sales team, I really enjoy working together towards new objectives! I am particularly interested in collaborating in complex projects, e.g. linking up with our customers through electronic data interchange. Even if that means endless days of puzzling over possible solutions, it's unbelievably rewarding to successfully manage such challenges together with my colleagues.

I especially appreciate CODICO for its pleasant working environment. My colleagues have meanwhile become my friends, and the opportunity to work independently allows me to outgrow myself on a daily basis! I have succeeded in establishing a very good balance between my work and my private life. Friends and family give me the necessary backing and support in life. I am a passionate tennis player. You will find me on a tennis court almost every day, indoors during the winter season and outdoors during the summer months. Since my family and my friends share my passion for tennis, I can reconcile it well with my private life. Depending on the weather, you may also find me on ski slopes, beach volley courts, or in the gym. This helps me establish a good balance to my professional life. Apart from sports, I also like spending my time with friends, having a relaxed coffee or dancing with them in some trendy club. I recently attended the Gustav Käser sales seminar, which greatly inspired me to start every day in a positive spirit, so I would like to share this important part of the training with you. When you wake up in the morning, ask yourself this question: »Why am I happy today?« There are certainly things in everyone's life over which they can rejoice. We just need to remind ourselves of what they are. It did not take me long to realize that this greatly contributes to better self-motivation and a positive approach to life. I am looking forward to managing future challenges together with you.

D08

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